

SELECTED



**WATER
RESOURCES
ABSTRACTS**



VOLUME 7, NUMBER 8
APRIL 15, 1974

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SELECTED WATER RESOURCES ABSTRACTS

**A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior**



**VOLUME 7, NUMBER 8
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W74-03751 - W74-04300

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by co-ordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

THE INTERACTION OF WATER WITH ORGANIC SOLUTE SPECIES, Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

C. L. Liotta, H. P. Hopkins, Jr., and M. Perdue. Availability from NTIS as PB-227 250 \$5.00 in paper copy, \$1.45 in microfiche. Report ERC-1473, Sept 1973, 140 p, 10 fig, 12 tab, 101 ref, 1 appendix. OWRR B-049-GA(10). 14-31-0001-3269.

Descriptors: *Physiochemical properties, *Entropy, *Enthalpy, *Thermal properties, Thermodynamic behavior, Ionization, *Phenols, Aqueous solutions, *Organic acids.
Identifiers: Gibbs free energy, Anilinium, Pyridinium, Organic bases.

A detailed investigation was made of the relative contributions of the enthalpy and entropy of ionization to the Gibbs free energies of ionization of substituted anilinium ions, pyridinium ions, and thiophenol. Enthalpies of ionization were determined calorimetrically in aqueous solution. Entropies of ionization were calculated from the experimental enthalpies and literature Gibbs free energies. The experimental data for substituted anilinium ions and pyridinium ions showed that plots of Gibbs free energies of ionization versus Enthalpies of ionization and Gibbs free energies of ionization versus Entropies of ionization were linear for both acid systems. The slopes of the plots for both anilinium ions and pyridinium ions indicate that substituent effects are manifested primarily in the enthalpy rather than the entropy of ionization. In contrast, substituent effects in the ionization of neutral organic acids such as phenols and benzoic acids are primarily due to entropy changes. A comparison of the thermodynamics of ionization of thiophenol and phenol reveals that the greater acidity of thiophenol is primarily due to a more positive entropy of ionization. Furthermore, a comparison of the aqueous and gas phase thermodynamic functions shows that the more positive entropy of ionization of thiophenol is almost entirely due to 'looser' solvation of the thiophenoxy anion in aqueous solution. Detailed methods are presented that will allow the sanitary engineer to estimate the thermodynamic properties of many classes of organic acids and bases in water at any temperature and pressure.

W74-03762

2. WATER CYCLE

2A. General

WATER RESOURCES NEWSLETTER, JUNE 1973.

Australian Water Resources Council, Canberra. For primary bibliographic entry see Field 4A.

W74-03774

PROBLEMS IN MATHEMATICAL MODELING OF HYDROLOGIC PROCESSES (VOPROSY MATEMATICHESKOGO MODELIROVANIYA GIDROLOGICHESKIH PROTSESSOV). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyi Gidrologicheskii Institut Trudy, No 211, M. S. Grushevskiy, editor, Leningrad, 1973. 228 p.

Descriptors: *Hydrology, *Mathematical models, *Model studies, Analog models, Computers, Linear programming, Optimization, Probability, Stochastic processes, Time series analysis,

Streamflow, Runoff, Hydrographs, Unit hydrographs, Floods, Watersheds(Basins), Meteorology, Effective precipitation, Snowmelt, Waves(Water), Equations, *Open channels. Identifiers: USSR.

Use of mathematical models in hydrology is discussed in this collection of 11 papers published by the Leningrad State Hydrologic Institute. Problems in mathematical modeling of streamflow and other hydrologic processes are examined, and linear and more complex models are used to construct flood-discharge hydrographs and to compute maximum runoff on watersheds in the Maritime Territory. Transformation of complex waves in open channels and development of wind waves are described, and a genetic method is proposed for calculating channel storage in a river reach. Fundamentals of the crossing theory are explained, and possibilities of its direct application to study of meteorological processes and to time series analysis are considered. (Josefson-USGS)
W74-03830

UNCERTAINTIES IN HYDROLOGIC MODELS, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

S. Inc.

In: Proceedings of International Symposium on Uncertainties in Hydrologic and Water Resources Systems, December 11-14, 1972, Tucson, Arizona, Volume III, p 934-939. (1973).

Descriptors: *Model studies, *Hydraulic similitude, *Risks, *Testing, Variability, Physical models, Simulation, Design, Engineering, Calibrations, Projects, Project planning.

Hydraulic models are frequently employed in arid areas to find analytical answers to design problems. Although numerical solutions to such problems using the digital computer are becoming abundant, there are problems which still lend themselves to hydraulic models, including certain mobile bed fluvial hydraulic problems significant in arid regions. The successful use of these models for engineering design purposes depends a great deal upon the exposure, interpretation, and resolution of uncertainties at each step of the study, namely model calibration, model validation, and experimentation with the model. For the model calibration step, three sources of uncertainties are those about the modeling parameters, in the prototype data, and in the instrumentation. The validation of the model is subject to the same uncertainties but usually suffers also from the fact that all data have been used in some form or another for the calibration and there is not sufficient time to collect additional data. Nevertheless, instrumentation of hydraulic models has reached great heights of sophistication. Most of the variables can be measured with great precision, and control of the model, data acquisition and processing can be done by computers. While not cheap, it still requires field surveys and competent investigators. (Muller-Arizona)
W74-03916

THE ROLE OF MOORS IN GROUNDWATER RECHARGE (DIE ROLLE DER MOORE BEI DER GRUNDWASSERNEUBILDUNG), Auseninstitut fuer Moorforschung und Angewandte Bodenkunde, Bremen (West Germany). For primary bibliographic entry see Field 2F.

W74-04251

WATER QUALITY CYCLE--REFLECTION OF ACTIVITIES OF NATURE AND MAN, California State Dept. of Water Resources, Los Angeles. Southern District.

For primary bibliographic entry see Field 5B.

W74-04263

2B. Precipitation

PRECIPITATION AS A NUTRIENT AND HYDROGEN ION SOURCE FOR FORESTED WATERSHEDS IN THE MISSOURI VICINITY, Montana Univ., Missoula. School of Forestry. For primary bibliographic entry see Field 5B.

W74-03766

INVESTIGATION OF THE EFFECTS OF URBANIZATION ON PRECIPITATION TYPE, FREQUENCY, AREAL AND TEMPORAL DISTRIBUTION, PHASE II, Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Institute. For primary bibliographic entry see Field 4C.

W74-03768

STORMS CAUSING HARBOR AND SHORELINE DAMAGE THROUGH WIND AND WAVES NEAR MONTEREY, CALIFORNIA, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 2J.

W74-04208

FINE STRUCTURE MEASUREMENT OF TEMPERATURE AND MOISTURE OVER THE MONTEREY BAY, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 2L.

W74-04222

STATISTICAL CHARACTERISTICS OF THUNDERSTORMS IN YAKUTSK ASSR (STATISTICHESKIYE KHARAKTERISTIKI GROZ YAKUTII), Institute of Geography of Siberia and the Far East, Irkutsk (USSR).

A. Kh. Filippov, and D. F. Khutoryanskaya. Institut Geograffi Sibiri i Dal'nego Vostoka Doklady, No 31, p 39-46, 1971. 3 fig, 3 tab, 5 ref.

Descriptors: *Thunderstorms, *Statistics, *Statistical methods, Probability, Variability, Time, Frequency, Distribution patterns, Orography, Meteorology, Air masses, Fronts(Atmospheric), Maps, Equations. Identifiers: *USSR(Yakutsk).

The Yakutsk Autonomous Soviet Socialist Republic is located in an area of relatively low thunderstorm activity. The number of thunderstorm days per year ranges from 0.1 in the far north to 19-20 in southern mountainous regions. Three regions of high thunderstorm activity were identified: (1) the southern mountainous part of the republic, where the number of thunderstorm days per year is 18-19; (2) the mountainous and piedmont parts of the Verkhoyansk mountain range, where the number of thunderstorm days per year is 9-10; and (3) the southeastern mountainous part of the republic, where the number of thunderstorm days per year is 9-10. Two regions of relatively low thunderstorm activity are associated with low-lying areas and are located in river valleys. These are the middle part of the Lena River Valley, where the number of thunderstorm days per year is 5-8, and the region of the Oymyakon Depression, where the number of thunderstorm days per year is 6. Total time duration of a thunderstorm varies widely from 38 hours in southern mountainous regions to 2-3 hours in the northern part of the Republic. Maximum thunderstorm activity occurs in July with the number of thunderstorm days usually varying from 2-4 in the north to 8 in southern regions. In April and September, thunderstorms are extremely rare and occur, on the average, once every 10-20 years. Maximum time duration of a thunderstorm occurs in July, ranging from 1-2 hours per month in northern regions to 15 hours per month in the south. Distribution of the number of thunderstorm days and

Field 2—WATER CYCLE

Group 2B—Precipitation

of the time duration of thunderstorms per year is mapped, and confidence limits for the average number of thunderstorm days at 8 stations and statistical parameters of thunderstorms at 18 stations in the Republic are tabulated. (Josefson-USGS)
W74-04253

SOME CAUSES OF FAILURE IN THE CLOSENESS OF CORRELATIVE CONNECTION BETWEEN TREE SPECIES TRANSPERSION AND METEOROLOGICAL FACTORS, (IN RUSSIAN),

For primary bibliographic entry see Field 2D.
W74-04283

2C. Snow, Ice, and Frost

ALASKA WATER RESOURCES RESEARCH NEEDS FOR THE 70'S.

Alaska Univ., College, Inst. of Water Resources.

For primary bibliographic entry see Field 6B.
W74-03757

WATER BALANCE OF A SMALL LAKE IN A PERMAFROST REGION,

Alaska Univ., College, Inst. of Water Resources.

For primary bibliographic entry see Field 2H.
W74-03758

INTEGRATED MEASUREMENT OF SOIL MOISTURE BY USE OF RADIO WAVES,

Utah State Univ., Logan, Coll. of Engineering.

D. G. Chadwick.

Available from the National Technical Information Service as PB-227 242; \$4.00 in paper copy, \$1.45 in microfiche. Utah State University, Logan, Utah Water Research Laboratory Publication PRWG103-1, Completion Report, November 1973, 87 p, 34 fig, 3 tab, 8 ref, append. OWRR B-062-UTAH(2). 14-31-0001-3657.

Descriptors: *Soil moisture, *Radio waves, Dielectric, Conductivity, Measurement, Instrumentation, Electronic equipment.

Identifiers: *Measurement accuracy.

An integrated value of soil moisture can be determined by measuring the attenuation of vertically-polarized surface radio waves that are propagated over the ground between a transmitting and receiving antenna. Soil moisture values in the root-zone region were measured over longitudinal distances typically ranging from 50 feet to 600 feet with good results. Integrated soil moisture measurements over greater distances are also possible. The received field strength of propagated radio surface waves closely matches theoretical calculations. The measurement is easily made and does not disturb the soil. Dense, green vegetation, such as alfalfa or corn, causes errors in measurement accuracy. Less dense vegetation, such as range land, does not seriously affect measurement accuracy. The described equipment is portable and can be used by an unskilled operator.
W74-03772

THE WATER-ICE PHASE COMPOSITION OF CLAY-WATER SYSTEMS: I. THE KAOLINITE-WATER SYSTEM,

Cold Regions Research and Engineering Lab., Hanover, N. H.

For primary bibliographic entry see Field 2G.
W74-03783

DATA OF GLACIOLOGICAL STUDIES, CHRONICLE AND DISCUSSIONS (MATERIALY GLYATSIOLOGICHESKIKH ISSLEDOVANIY. KHRONIKA, OBSUZHDENIYA).

Akademija Nauk SSSR, Moscow. Institut Geografii.

MATERIALY GLYATSIOLOGICHESKIKH ISSLEDOVANIY. KHRONIKA, OBSUZHDENIYA, No 19, G. A. Avsyuk, and V. M. Kotlyakov, editors, Moscow, January 1972. 324 p.

Descriptors: *Glaciology, *Glaciation, *Glaciers, *Mountains, Alpine, Ice, Snowpacks, Avalanches, Runoff, Movement, Melting, Glaciohydrology, Glacial drift, Arctic, Antarctic, Meteorology, Investigations, Conferences, Maps, Equations.

Identifiers: *USSR, Glacier mass balance, Paleoglaciology, Icings.

This issue is the 19th collection of articles on 'Data of Glaciological Studies' in the series 'Chronicle and Discussions,' published by the Department of Glaciology of the USSR Academy of Science's Institute of Geography. Subjects discussed include: (1) report on glaciological investigations in the USSR in 1967-70; (2) glaciology at the Fifteenth General Assembly of the International Union of Geodesy and Geophysics; (3) mechanism of glacier pulsations; (4) map of annual river runoff in the Pamirs and Pamir-Alay Mountains; (5) heat balance on the surface of Marukha Glacier; (6) modern and ancient glaciers in the Suntar-Khayata Mountains; (7) history of development of the Antarctic glacier cover; (8) general outline of Upper Quaternary and historic glaciations in the Caucasus and Tien Shan; (9) changes in ice volume of Fedchenko Glacier over a 30-year period (1928-58); (10) effects of phase composition and structure of sea ice on its elastic and dielectric properties; (11) design of snow-retaining structures and terraces on avalanche-risk slopes of railway lines; (12) distance of avalanche flowage as a function of snow density; (13) techniques in investigations of glacier fluctuations; (14) observations in a representative glacier basin of the Bol'shaya Khadata River in 1969-70; (15) icings in the Suntar-Khayata Mountains; (16) avalanches and their role in the nourishment of the Inyl'chek Glacier; and (17) modern glaciers in mountains of Central Asia. (See also W74-03836) (Josefson-USGS)
W74-03835

A MAP OF ANNUAL RIVER RUNOFF IN THE PAMIRS AND PAMIR-ALAY MOUNTAINS (KARTA GODOVOGO STOKA REK PAMIRA I PAMIRO-ALAYA),

For primary bibliographic entry see Field 2E.
W74-03836

A LANDSCAPE ZONATION FOR THE SOUTHERN AND CENTRAL MACKENZIE RIVER VALLEY BASED ON TERRAIN PERMAFROST CHARACTERISTICS,

Northern Forest Research Center, Edmonton (Alberta).

C. B. Crampton.

Canadian Journal of Earth Sciences, Vol 10, No 12, p 1843-1854, December 1973. 7 fig, 1 tab, 5 ref.

Descriptors: *Permafrost, *Terrain analysis, Soil-water-plant relationships, Paleoclimatology, Geomorphology, Aerial photography, *Canada, *Soil types.

Identifiers: Mackenzie River valley.

A landscape zonation is presented for the southern and central Mackenzie River valley, based on observed changes in permafrost characteristics of selected terrain types, with changing climatic implications. The relative abundance of lichen on specified terrain types suggests the thickness of the active layer within the discontinuous permafrost zone, and is a useful guide in air photograph interpretation for extensive mapping of landscape-permafrost relationships between localities of ground inspection. Widespread, fossil, cryoturbated terrain supports the contention that today's climate in the study area is less severe than that in the past. (Knapp-USGS)
W74-04266

2D. Evaporation and Transpiration

WATER VAPOR MOVEMENT THROUGH MULCHES UNDER FIELD CONDITIONS, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

For primary bibliographic entry see Field 2G.
W74-03784

A RESISTANCE MODEL TO PREDICT EVAPOTRANSPIRATION AND ITS APPLICATION TO A SUGAR BEET FIELD,

Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.

K. W. Brown, and N. J. Rosenberg.

Agronomy Journal, Vol 65, p 341-347, May-June 1973. 7 fig, 1 tab, 29 ref. OWRR A-017-NEB(1).

Descriptors: *Evapotranspiration, *Water loss, *Latent heat, Energy Budget, Energy transfer, Consumptive use, Transpiration, Heat balance, Radiation, Heat budget, Model studies, *Resistance networks, Evaporation, *Sugar beets, *Nebraska.

Procedures to project detailed micrometeorological and lysimetric determinations of evaporation and its dependence on the microclimate and crop factors to fields where such measurements have not been conducted are required. The dependence of latent heat flux of a crop on crop resistance, air resistance, air temperature, water vapor pressure and net incident radiation less soil heat flux was evaluated in a Nebraska field employing an electrical resistance analogue of the energy transfer process and an energy balance equation. The inherent difficulties in model application to both the single leaf and the crop are discussed. In applying the resistance model to a field crop the primary problem may be that sources and sinks of heat flux are not necessarily identical within the crop system. Hourly latent heat predicted by the model and that determined by energy balance generally agree within 5%, and daily totals agree in all cases. Sugar beet crop evapotranspiration is thus successfully modeled by this method. As more detailed data on experimental fields becomes available, the model may prove useful in application to extensive vegetated areas as well as being employed in larger models of total hydrologic systems where evapotranspiration is an important component. (Muller-Arizona)
W74-03921

THE ESTIMATION OF NET RADIATION AND POTENTIAL EVAPOTRANSPIRATION USING ATMOMETER MEASUREMENTS,

Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.

A. C. Dilley, and I. Helmond.

Agricultural Meteorology, Vol 12, p 1-11, 1973. 2 fig, 1 tab, 18 ref.

Descriptors: *Evapotranspiration, *Atmometers, *Radiation, *Solar radiation, *Arid lands, *Irrigation, Measurement, Evaporation pans, Transpiration, Lysimeters, Correlation analysis, Irrigation effects.

The estimation of evapotranspiration is necessary to evaluate the irrigation requirements of a crop in arid regions. The various evaporation rates of freely transpiring crops and of two differentially shaded atmometers sited above the crop are evaluated with respect to a combination-type formula. Relationships between the atmometer evaporation rates and the two terms of the formula describing crop evaporation are examined and established experimentally for a pasture surface. A high correlation was found between measured and estimated values of net radiation and crop potential evapotranspiration. (Muller-Arizona)
W74-04129

WATER CYCLE—Field 2

Streamflow and Runoff—Group 2E

EFFECT OF IRRIGATION FREQUENCY ON THE AVERAGE EVAPOTRANSPIRATION FOR VARIOUS CROP-CLIMATE-SOIL SYSTEMS,
Universidad Católica de Chile, Santiago. Departamento de Edafología.
For primary bibliographic entry see Field 3F.
W74-04140

SOME CAUSES OF FAILURE IN THE CLOSENESS OF CORRELATIVE CONNECTION BETWEEN TREE SPECIES TRANSPERSION AND METEOROLOGICAL FACTORS, (IN RUSSIAN),

Ts. M. Khashes, and V. I. Bobro.

Ekologiya, Vol 3, No 2, p 102-104. 1972.

Identifiers: Berlin poplar, *Meteorological condition, Oak, Poplar, Temperature, *Transpiration(Trees), White willow, White acacia, *Correlation coefficient, *Tree species.

During the investigation of relation between transpiration and meteorological factors in a variety of trees, it was established that such a relation is much stronger during the first half of the day. The correlation coefficient between transpiration and air temperature was between 0.8-0.62, which shows a direct dependence of these 2 factors. The temperature during these experiments was not lower than 12°C and not higher than 33-34°C. Results of trees such as white willow, Berlin poplar, white acacia and oak are presented.—Copyright 1973, Biological Abstracts, Inc.
W74-04283

2E. Streamflow and Runoff

RIVER RESPONSE,
Colorado State Univ., Fort Collins.
J. Santos-Cayade, and D. B. Simons.
In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 1, p 1-1-25, 1973. 14 fig, 19 ref.

Descriptors: *Channel morphology, *Sedimentation, *Channel erosion, Bed load, Suspended load, Regime, Sediment transport, Discharge(Water), Alluvial channels, Profiles, Graded, Equilibrium, Rivers.

Fluvial systems adjust continuously to the effects of the erosion cycle. When a river system is looked upon from the engineering time frame of reference, the cause and effect relations vary with respect to geologic time. Of special interest are the independent variables (water and sediment discharge) and the dependent variable (channel morphology). Most streams flow in channels that may vary locally with space and time, but over an extended reach the streams display somewhat constant dimensional characteristics. The delicate equilibrium established between water-sediment discharge and slope-channel geometry is altered when trends or changes are introduced in the water and/or sediment discharge time series of a graded stream. Then the river system adjusts toward a new channel geometry and slope that will be in dynamic equilibrium with the modified water and sediment time series. If the modified time series reaches a stationary state so will the slope and channel characteristics. However, the river system response is manifested with a time lag in reference to permanent changes in the water and sediment time series. Relationships were derived to provide an initial step toward the analysis of river system response to water resources development that affect the water and sediment discharge characteristics of the river system. Applications of the relationships are prediction of possible future changes of river stage and form resulting from significant variations in water and sediment discharge characteristics of the river. (Knapp-USGS)
W74-03785

FLOW OVER ALLUVIAL BED,
Colorado State Univ., Fort Collins. Engineering Research Center.
H. W. Shen.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 2, p 2-1-2-31, 1973. 16 fig, 1 tab, 44 ref.

Descriptors: *Alluvial channels, *Roughness(Hydraulic), *Channel morphology, *Flow, Channel flow, Open channel flow, Flow friction, Streamflow, Regime, Erosion, Sedimentation.

When fluid flows over a movable bed, the bed surface is normally deformed into various configurations. Some of the available methods of estimating as well as predicting these resistances, some of the difficulties in analyzing alluvial bed form resistance, and a few recent studies on the statistical properties of bed forms are discussed. The alluvial bed resistance problem is by no means solved. The problem is not only due to the difficulty of predicting form roughness but also the difficulty of using the correct skin roughness. The investigation on the statistical properties of alluvial bed profiles offers promise. It is especially attractive for the investigation on the similarities and differences between laboratory bed forms where flow depths are limited and river bed forms where bed forms are not normally limited by flow depth and width. (Knapp-USGS)
W74-03786

FLOW RESISTANCE OVER SHORT SIMULATED VEGETATION AND VARIOUS TALL SIMULATED VEGETATION GROUPINGS ON FLOW RESISTANCE AND SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Engineering Research Center.

H. W. Shen.
In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 3, p 3-1-3-51, 1973. 25 fig, 4 tab, 47 ref.

Descriptors: *Flow resistance, *Vegetation effects, *Sediment yield, *Fluid friction, *Roughness(Hydraulic), Equations, Shear drag, Hydraulics, Open channel flow, Retardance.

Flow resistance over short vegetation and the effect of reducing sediment yield by retarding flow rates due to flow through tall vegetation on the order of flow depth are discussed. The retardation of flow rate due to tall vegetations, whose heights are of the same order of magnitude as flow depth, can be estimated if the spacing between the vegetation is at least 6 diameters in the downstream direction and 3 diameters in the transverse direction. Tall vegetation grouped into staggered patterns is much more effective in reducing flow rate than any other pattern. The average boundary shear stress on the bed is much more sensitive to its change of plot bottom slope and the size of vegetation than the variation of flow discharge and sediment size. The retardation of boundary shear stress on the bed will increase significantly as trees grow larger. (Knapp-USGS)
W74-03787

THE RHEIN STUDY,
California Univ., Berkeley.
For primary bibliographic entry see Field 2J.
W74-03788

REGIME PROBLEMS OF RIVERS FORMED IN SEDIMENT,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 2J.
W74-03789

NATURAL MIXING PROCESSES IN RIVERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W74-03790

EVALUATION OF THERMAL POLLUTION CONTROL ALTERNATIVES,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W74-03791

MECHANICS OF HEAT TRANSFER IN NON-STRATIFIED OPEN-CHANNEL FLOWS,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 5B.
W74-03792

SOME EFFECTS OF WASTES ON NATURAL WATERS,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 5B.
W74-03793

HEATED SURFACE DISCHARGES INTO FLOWING AMBIENT STREAMS AND LAKES,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5D.
W74-03794

FISH BEHAVIOR RELATED TO THERMAL POLLUTION,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 5C.
W74-03795

AGRICULTURAL IMPACT ON WATER QUALITY IN WESTERN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-03796

DISPERSION OF CONTAMINANTS ATTACHED TO SEDIMENT BED LOAD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-03797

BEHAVIOR OF COHESIVE MATERIAL FROM A SOIL ENGINEER'S VIEWPOINT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-03798

UPSLOPE EROSION ANALYSIS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W74-03799

APPLICATION OF REMOTE SENSING TO RIVER MECHANICS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. F. Ruff.
In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 16, p 16-1-16-22, 1973. 14 fig.

Field 2—WATER CYCLE

Group 2E—Streamflow and Runoff

Descriptors: *Remote sensing, Rivers, *River systems, *Data collections, *Aerial photography, Water temperature, Mapping, Channel morphology, Infrared radiation, Water pollution.

Applications of multiband photography, precision mapping camera photography, and thermal infrared imagery obtained with a line scanner for evaluating certain characteristics related to river mechanics are summarized. These three remote sensing systems provide a record of the intensity of electromagnetic energy being reflected or emitted from a terrestrial scene. There is a variety of film-filter combinations available for photographic work over the wavelengths from approximately 0.3 micrometer to 0.9 micrometer; optical-mechanical line scanners with appropriate detectors can be used for obtaining imagery in a variety of wavelength bands. The data can provide a quasi-synoptic survey of flow phenomena over relatively large areas. The thermal infrared wavelengths are of value for mapping the radiometric temperature patterns at the surface. (Knapp-USGS)

W74-03800

SUSPENDED-SEDIMENT SAMPLING VARIABILITY,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 2J.
W74-03801

FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON, PART 2,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W74-03803

FLOODS IN IOWA: TECHNICAL MANUAL FOR ESTIMATING THEIR MAGNITUDE AND FREQUENCY,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 4A.
W74-03805

FLOODS OF THE 1970 AND 1971 WATER YEARS IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
C. H. Tate.
Mississippi Board of Water Commissioners Bulletin 73-2, October 1973. 20 p, 5 fig, 2 tab, 3 ref, append.

Descriptors: *Floods, *Flood profiles, *Peak discharge, *Mississippi, Flood data, Flood frequency, Flood peak, Rainfall, Hydrologic data, Gaging stations, Streamflow, Flow rates.

Floods in Mississippi during the 1970 and 1971 water years were of limited areal extent. Peak discharges exceeding those of 50-year recurrence intervals were observed at some sites during five events in the 2-year period. The emphasis of this report is on the peak stages and discharges of streams. The rainfall data give a generalization of its amounts and variability. This is one of a series of reports on flood events in Mississippi. (Woodard-USGS)
W74-03816

ANNUAL COMPILED AND ANALYSIS OF HYDROLOGIC DATA FOR ELM FORK TRINITY RIVER, TRINITY RIVER BASIN, TEXAS, 1971,
Geological Survey, Austin, Tex.
E. D. Lucero.
Open-file report, December 1973. 27 p, 2 fig, 2 tab.

Descriptors: *Streamflow, *Hydrologic data, *Runoff, *Texas, Data collections, Rainfall, Rain gages, Flow rates, Gaging stations, Flood protection, Flood control, Watershed management.
Identifiers: *Trinity River basin(Tex).

This report, the 12th and last in a series of annual basic-data reports for the Elm Fork Trinity River, Texas, study area, contains the rainfall, runoff, and storage data collected during the 1971 water year for the 46.0-square-mile area above the stream-gaging station Elm Fork Trinity River near Muenster. The locations of floodwater-retarding structures and hydrologic-instrument installations in the area are shown. The 14 floodwater-retarding structures provide capacity for flood-detention storage of 10,500 acre-feet of flood runoff from 33.5 square miles of the 46.0-square-mile drainage area. A summary of the physical data of each of the 14 floodwater-retarding structures is tabulated. The yearly average rainfall from rain gages in the area for the 1971 water year was 23.30 inches, or 70% of the 15-year (1957-71) average. Yearly mean discharge at the stream-gaging station was 4.79 cfs, compared with the 15-year (1957-71) average of 19.0 cfs. Total runoff during the year was 3,470 acre-feet, 1.41 inches, which is 6% of the total rainfall. (Woodard-USGS)

W74-03818

QUASI 2-YEAR VARIATION IN RUNOFF OF USSR RIVERS (KVAZIDVUKHLETNYA VARIATSIYA V STOKE REK SSSR),
O. F. Kondratsova, and N. P. Smirnov.
Vsesoyuznoye Geograficheskoye Obschestvo Izvestiya, Vol 105, No 2, p 149-160, March-April 1973. 7 fig, 3 tab, 28 ref.

Descriptors: *Runoff, *Rivers, *Variability, *Atmosphere, *Air circulation, Winds, Cycles, Discharge(Water).
Identifiers: *USSR, Stratosphere, Spectrograms.

Increased emphasis is placed on the study of a 2-year variation in long-term fluctuations of river runoff in connection with discovery of a 2-year wind oscillation in the stratosphere. Average monthly water discharges at 35 gaging stations on 16 rivers in European Russia, 6 rivers in Soviet Central Asia, and 13 rivers in Siberia were subjected to spectral and periodogram analysis. Except for several rivers in East Siberia, a variation having a period of about 25-30 months is observed in runoff fluctuations of USSR rivers in 1931-62. This variation is most clearly expressed on rivers in European Russia and Soviet Central Asia and is poorly expressed on rivers in northern regions of East Siberia. The contribution of this variation to total variability of runoff during the period under investigation is, on the average, 20%-25%. General patterns in the manifestation of a quasi 2-year cycle in runoff of USSR rivers are determined by changes in the pressure field depending on the stratospheric cycle. Increased runoff for almost all European Russia and northern regions of East Siberia and diminished runoff for extreme southeastern European Russia, Soviet Central Asia, and southern regions of West and East Siberia correspond to periods of easterly currents in the equatorial stratosphere. The opposite picture in runoff distribution for the USSR is observed during periods of westerly currents in the equatorial region. (Josefson-USGS)

W74-03834

Descriptors: *Waves(Water), *Flow, *Approximation method, *Free surfaces, *Mathematical models, Model studies, Fluid mechanics, Open channel flow.
Identifiers: *Asymptotic theory, *Helical waves.

Surface waves in a viscous incompressible fluid with surface tension in an open channel of arbitrary cross section were studied. Both linearized and nonlinear problems are considered. An abstract approach based upon the theory of Hilbert spaces is adopted to investigate the linearized problem, and a perturbation method is used to study the nonlinear problem. The unique solvability of the linearized Navier-Stokes equations is proved by using the Galerkin's method. Centering around the concept of a critical speed of the surface wave, a singular perturbation scheme within the framework of long wave approximation is developed to study the asymptotic behavior of nonlinear surface waves in the channel. A critical Reynolds number is then obtained from this scheme as a criterion for the stability of the wave motion. By the use of various L2-estimates, a rigorous justification of the singular perturbation is made for the linearized problem in which the channel surface is an inclined plane.

W74-03901

DATA OF GLACIOLOGICAL STUDIES CHRONICLE AND DISCUSSIONS (MATERIALY GLYATSIOLOGICHESKIKH ISSLEDOVANIY. KHRONIKA, OBSUZHDENIYA).
Akademiya Nauk SSSR, Moscow. Institut Geografi.
For primary bibliographic entry see Field 2C.
W74-03835

A MAP OF ANNUAL RIVER RUNOFF IN THE PAMIRS AND PAMIR-ALAY MOUNTAINS (KARTA GODOVOGO STOKA REK PAMIRO-ALAYA),
A. O. Kemmerikh.
In: Materialy glyatsiologicheskikh issledovaniy. Khroniika, Obsuzhdeniya, No 19, p 53-59, Moscow, January 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Maps, *Average runoff, *Annual, *Rivers, *Mountains, Slopes, Elevation, Alpine, Glaciers, Watersheds(Basins), River basins, Discharge(Water), Variability, Investigations. Identifiers: *USSR(Pamirs-Alay Mountains).

The Pamir and Pamir-Alay mountain ranges are among the highest in the USSR. Many peaks rise to 5,000-6,000 m, and individual peaks exceed 7,000 m above sea level. A map of average annual runoff of rivers in this region was based on hydrologic investigations conducted in 1962-69 and on analysis of natural conditions and known runoff data. Relations between average annual discharge and average basin elevation were based on data of 135 hydrologic stations with periods of record ranging from more than 25 years to less than 5 years. Runoff increases with basin elevation to 4,500-4,700 m and decreases from peripheral western, southwestern, and southern ridges inland in an easterly and northeasterly direction. The largest area of maximum runoff (4,225 sq km) with specific discharges of 40-50 liters/sec/sq km is located in the Koksu, Yarkhych, Sorbog, Sokh, and Zarafshan River basins. Total annual runoff from the basin area of the Pamir and Pamir-Alay ranges if 65.11 cu km, which corresponds to an average specific discharge of 12.2 liters/sec/sq km. Runoff of rivers from northern slopes of the Alay and Turkestan ridges (covering 22,088 sq km) into the Syr-Dar'ya River is 6.75 cu km (10.3%) at an average specific discharge of 9.1 liters/sec/sq km. Runoff of rivers in the Amu-Dar'ya basin, covering 138,657 sq km, is 56.58 cu km (86.9%) at an average specific discharge of 13 liters/sec/sq km. Variability of annual runoff on rivers in the Pamir and Pamir-Alay ranges is comparatively small. Coefficients of variation of annual runoff are, on the average, 0.10 to 0.20, and only for rivers in low mountain regions of the Pamir-Alay range do they reach 0.25-0.35. The coefficient of variation decreases with increasing basin glaciation. (See also W74-03835) (Josefson-USGS)

W74-03836

CONTRIBUTIONS TO THE THEORY OF SURFACE WAVES ON A VISCOUS FLUID,
Wisconsin Univ., Madison. Dept. of Mathematics. S-M. Shih.

Available from the National Technical Information Service as PB-227 457: \$10.50 in paper copy, \$1.45 in microfiche. Ph.D. thesis, 1973. 135 p, 25 ref. OWRR A-037-WIS(8). 14-31-0001-3250.

Descriptors: *Waves(Water), *Flow, *Approximation method, *Free surfaces, *Mathematical models, Model studies, Fluid mechanics, Open channel flow.
Identifiers: *Asymptotic theory, *Helical waves.

Surface waves in a viscous incompressible fluid with surface tension in an open channel of arbitrary cross section were studied. Both linearized and nonlinear problems are considered. An abstract approach based upon the theory of Hilbert spaces is adopted to investigate the linearized problem, and a perturbation method is used to study the nonlinear problem. The unique solvability of the linearized Navier-Stokes equations is proved by using the Galerkin's method. Centering around the concept of a critical speed of the surface wave, a singular perturbation scheme within the framework of long wave approximation is developed to study the asymptotic behavior of nonlinear surface waves in the channel. A critical Reynolds number is then obtained from this scheme as a criterion for the stability of the wave motion. By the use of various L2-estimates, a rigorous justification of the singular perturbation is made for the linearized problem in which the channel surface is an inclined plane.

W74-03901

PHYSICAL EFFECTS OF MAINTAINING DRAINAGE CHANNELS IN NORTH CAROLINA'S COASTAL AREA,
Soil Conservation Service, Raleigh, N.C.

WATER CYCLE—Field 2

Streamflow and Runoff—Group 2E

W. R. Swicegood, and G. J. Kriz.
Journal of Soil and Water Conservation, Vol 28,
No 6, p 266-269, November-December 1973. 5 fig,
1 tab.

Descriptors: *Open channel flow, *Vegetation effects, *North Carolina, *Channel improvement, Drainage systems, Open channels, Silting, Dredging.
Identifiers: *Drainage channels.

Typical eastern North Carolina channels show a general trend toward capacity loss at a rate that would require complete channel modification every 10 to 15 years. The loss appears to be caused principally by uncontrolled vegetation, which emphasizes the importance of mowing the bottom and lower sections of channels. (Knapp-USGS) W74-04075

ON WIND TIDES AND LONGSHORE CURRENTS OVER THE CONTINENTAL SHELF DUE TO WINDS BLOWING AT AN ANGLE TO THE COAST,

National Engineering Science Co., Pasadena, Calif.

C. L. Bretschneider.

Available from NTIS as AD-645 703, for \$6.00 paper copy, \$1.45 microfiche. Report No. SN-134-13, December 1966. 58 p, 16 fig, 2 tab, 7 ref. Nonr-4177(00).

Descriptors: *Wind tides, *Coriolis force, *Continental shelf, Coasts, Mannings equation.
Identifiers: *Longshore currents.

The problem of wind tide caused by winds blowing at an angle to the coast is discussed. The major component of wind tide is that due to the wind stress directed perpendicular to the coast. The second component is that due to wind stress parallel to the coast and in effect is associated with the coriolis force or the rotation of the earth. Equations of hydrodynamical motion in two dimensions are presented. Certain assumptions are then made which lead to a direct analytical solution. One of the assumptions made is that the net transport shoreward is insignificant compared with the longshore transport, and in effect the net transport shoreward becomes zero under steady state conditions. Other assumptions made are that the rate of precipitation impact is negligible, the water surface slope parallel to the coastline is negligible, and that the higher order differentials along the coastline are much smaller than the corresponding counterparts directed perpendicular to the coastline. Finally, it is assumed that the bottom friction factor to be used with the longshore current can be approximated by use of n in Manning's equation. The special case of a continental shelf, bottom of constant slope, is treated in detail, although it is shown that the same principles can be applied to a composite bottom profile, representing a bottom of variable slope. (Sinha-OEIS) W74-04210

THE EFFECTS OF WIND AND PRECIPITATION ON THE MODIFICATION OF SOUTH BEACH, CRESCENT CITY, CALIFORNIA INCLUDING AN APPENDIX ON THE FOCUSING OF TSUNAMI ENERGY AT CRESCENT CITY,

Atmospheric Research Group, Altadena, Calif.

J. A. Roberts, and E. K. Kauper.

Available from NTIS as AD-607 944 for \$6.00 paper copy, \$1.45 microfiche. Final Report prepared for Army Environmental Sciences Division, October 1964. 32 p, 20 fig, 2 tab, 69 ref, 4 append. DA-49-092-ARO-38.

Descriptors: *Tsunamis, *Beaches, *Winds, Precipitation(Atmospheric), *California, Geomorphology, *Refraction(Water waves).
Identifiers: Crescent City(CA), *Wind waves, Swell, Submarine topography, Seamounts.

A study to assess and to observe the effects of the subaerial processes on a beach modified catastrophically by a geomorphologic agent uses a beach in the Crescent City, Calif. area as a base. After the preliminary field work, it was determined that the beach had indeed been modified but not, as originally thought, by the tsunamis of March 27-28, 1964. Following a brief climatic summary, information is given on beach configuration, instrumentation and data reduction techniques. Finally, possible mechanisms of beach modification are discussed. These refer to direct and indirect wind effects, precipitation, hydrology, wind waves and swell. Refraction diagrams, prepared by numerical-graphic means, indicate the possible focusing effects of two seamounts, northwest of the harbor. The tsunami traveling from the Prince William Sound Region of Alaska would be refracted with the apparent result that the wave front would be focused on the Crescent City area. It also appears that the segments of the refracted wave from may have arrived at Crescent City in phase. The result would have been wave heights of substantially greater magnitude than those of a single segment of the wave. (Sinha-OEIS) W74-04212

TIME DEPENDENT SHEAR STRESS BENEATH A SHOALING WAVE,

Naval Academy, Annapolis, Md.

For primary bibliographic entry see Field 2J.
W74-04213

THEORETICAL STUDY OF LONGSHORE CURRENTS ON A PLANE BEACH,

Massachusetts Inst. of Tech., Cambridge. Hydrodynamics Lab.

P. S. Eagleson.

Available from NTIS as AD-664 795 for \$6.00 paper copy, \$1.45 microfiche. Report No. 82, prepared for Army Coastal Engineering Research Center, December 1965. 54 p, 7 fig, 10 ref, 1 append. DA-49-055-CIV-ENG-62-9.

Descriptors: *Surf, *Beaches, *Currents(Water), Equations, Model studies.
Identifiers: *Longshore currents, Momentum flux.

Momentum flux considerations are used to formulate a differential equation governing the growth, with distance, of the mean longshore current velocity in the surf-zone on a plane, impermeable beach due to monochromatic waves. The equation is solved for the flow situation down-stream of a surf-zone barrier. Experiments are performed which verify this solution at least at laboratory scale. The asymptotic (uniform flow) form of the relation is also shown to be in good agreement with the field and laboratory data of other investigators. Conclusions are reached governing the size of laboratory models necessary to represent conditions of fully developed longshore currents. (Sinha-OEIS) W74-04214

WAVE SHOALING,

National Engineering Science Co., Pasadena, Calif.

B. J. LeMehaute, and L. M. Webb.

Available from NTIS as AD-608 744, for \$6.00 paper copy, \$1.45 microfiche. NESCO Report SN 134-2, April 1964. 94 p, 15 fig, 10 ref. Nonr-4177(00).

Descriptors: *Waves(Water), *Shallow water, *Gravity waves, Slopes, Energy.
Identifiers: *Shoaling(Waves), Periodic waves, Bottom topography, *Energy flux.

The concepts of energy flux and group velocity for nonlinear periodic gravity waves are discussed. The average energy flux, average energy per wavelength and 'group velocity' are calculated for irrotational periodic gravity waves at a third order

of approximation. Then the principle of conservation of transmitted energy between wave orthogonals is applied to the same order of approximation for determining the variation of wave height in decreasing depth. The results are presented as nomographs. The 'shoaling coefficient' needs to be expressed at least at a third order of approximation to account for experimental results. A summary is included of a literature survey which has been carried out on the problem of littoral processes. (See also W74-04216 and W74-04217) (Sinha-OEIS) W74-04215

WAVE SHOALING,

National Engineering Science Co., Pasadena, Calif.

R. C. Y. Koh, and B. J. LeMehaute.

Available from NTIS as AD-632 849, for \$6.00 paper copy, \$1.45 microfiche. NESCO Report SN-134-9, January 1966. 83 p, 7 fig, 10 ref, 4 append. Nonr-4177(00).

Descriptors: *Waves(Water), *Shallow water, *Continental shelf.

Identifiers: *Shoaling(Waves), *Surf zone, Periodic waves, *Wave spectra, Conservation of energy.

This study is a contribution to a larger project for studying the modification of wave spectra on the continental shelf and in the surf zone. Prior to dealing with a wave spectrum, a study of nonlinear effects on periodic waves appears to be necessary. For this purpose it is assumed that both friction effects and reflection effects are small. Then the principle of conservation of energy flux is applied to a periodic wave. The calculation is performed up to the fifth order and the corresponding result is compared with the third and first order of approximation. (See also W74-04215 and W74-04217) (Sinha-OEIS) W74-04216

LAMINAR AND AXISYMMETRIC VERTICAL JETS IN A STABLY STRATIFIED ENVIRONMENT,

Esso Research and Engineering Co., Forham Park, N.J.

For primary bibliographic entry see Field 8B.
W74-04224

AN IMPROVED MIXING LENGTH THEORY OF TURBULENT HEAT AND MASS TRANSFER,

Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 8B.
W74-04231

THERMAL INTERACTION OF TWO STREAMS IN BOUNDARY-LAYER FLOW SEPARATED BY A PLATE,

Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.

For primary bibliographic entry see Field 8B.
W74-04236

TRANSIENT HEAT AND MASS TRANSFER IN FULLY DEVELOPED LAMINAR TUBE FLOWS,

Saskatchewan Univ., Saskatoon. Dept. of Mechanical Engineering.

For primary bibliographic entry see Field 8B.
W74-04237

SELF-SIMILAR SOLUTIONS FOR A THREE-COMPONENT AXISYMMETRICAL FLOW OF A VISCOUS FLUID,

For primary bibliographic entry see Field 8B.
W74-04248

Field 2—WATER CYCLE

Group 2E—Streamflow and Runoff

THE STRUCTURAL-CONTINUUM THEORY OF DILUTE SUSPENSIONS OF RIGID ELLIPTOIDAL PARTICLES,
Kiev State Univ. (USSR).

For primary bibliographic entry see Field 8B.
W74-04249

'INTERNAL WAVES' ADVANCING ALONG SUBMARINE CANYONS,
Scripps Institute of Oceanography, La Jolla, Calif.
Geological Research Div.
F. P. Shepard, N. F. Marshall, and P. A.
McLoughlin.
Science, Vol 183, No 4121, p 195-198, January 18,
1974. 3 fig, 6 ref. NSF Contract GA-19492, ONR
Contract Nonr-2216(23).

Descriptors: *Submarine canyons, *Internal waves, *Currents(Water), Density stratification, Turbidity currents, Density currents, *California.

Patterns of alternating up- and downcanyon currents were traced along the axes of submarine canyons off California. The patterns arrive later at stations nearer the heads of coastal canyons. Where a canyon heads between two islands, the patterns advance down the axis. The propagation speeds of these patterns were estimated at 25 to 88 cm per second. Internal waves are the probable explanation. (Knapp-USGS)
W74-04261

2F. Groundwater

WATER RESOURCES OF THE NEW JERSEY PART OF THE RAMAPO RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-03806

APPRAISAL OF GROUND-WATER AVAILABILITY AND MANAGEMENT PROJECTIONS, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W74-03812

THE EFFECT OF FLUX AND GRAVITATIONAL FORCES ON MISCIBLE DISPLACEMENT IN A THIN HOMOGENEOUS BED,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
W. J. Esmail.

Available from the National Technical Information Service as PB-227 711; \$9.00 in paper copy, \$1.45 in microfiche. OWRR A-027-LA(1).

Descriptors: *Underground waste disposal, *Groundwater recharge, Water storage, *Injection wells, Recharge wells, Hydraulics, Artificial recharge, Saline aquifers, *Miscible displacement, *Mathematical models, *Gravitational water, Percolation, *Groundwater movement, *Secondary recovery(Oil), Water reuse.
Identifiers: Water flux, Dripping systems.

The study experimentally investigates gravitational effects in a dipping semi-bounded miniaquifer and also incorporates the effect of pre-existing ground-water movement (flux) in both horizontal and dipping systems. In all cases studied, the direction of the flux was parallel to the closed boundary of the system. In the horizontal system, flux always reduced recovery efficiency. Use of a closed boundary had little effect on recovery efficiencies presently reported as long as the boundary was not closely approached by the injected fluid. A mathematical model was developed for a three-dimensional system to predict the recovery efficiency for horizontal and dipping systems with or without flux. Recovery efficiencies predicted by the model were compared

to those obtained in 21 experimental runs. Good agreement was observed in all horizontal runs and in dipping systems in which no flux was present. Less agreement was shown in dipping systems in which flux was present. In such systems the agreement was good when flux rates were moderate, and poor when flux rates were high. Results of this study are applicable to miscible displacement operations where a density difference exists between the native and the injected fluids in horizontal and dipping systems. Subsurface waste disposal and the secondary recovery operations in the petroleum industry are examples of such applications.
W74-03896

HYDROGEOLOGY OF THE PRINCIPAL AQUIFERS IN SULLIVAN AND GREENE COUNTIES, INDIANA,
Geological Survey, Indianapolis, Ind.
L. W. Cable, and T. M. Robison.
Indiana Department of Natural Resources Division of Water Bulletin No 35, 1973. 26 p, 8 fig, 3 plate, 4 tab, 28 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Water quality, *Indiana, *Aquifer characteristics, Water wells, Water yield, Water level fluctuations, *Water analysis, Chemical analysis, *Groundwater movement, Precipitation(Atmospheric).

Identifiers: Sullivan County(Ind), Greene County(Ind).

The rocks that underlie Sullivan and Greene Counties, Indiana, may be placed in two general categories—consolidated and unconsolidated. Based on their water-bearing properties the consolidated rocks are subdivided into three major hydrologic units. Aquifers in unit 1 are relatively thickbedded limestone and sandstone bodies. The average yield from wells in this unit is 10 gpm with yields of as much as 100 gpm reported. The aquifers of unit 2 are sandstone bodies which occur throughout the strata of this unit. The average yield of wells in this unit is 5 gpm, and maximum yields are about 20 gpm. Unit 3 is similar in most respects to unit 2; however, in this unit there are fewer water-bearing sandstone bodies and, as a consequence, numerous dry holes are drilled. Aquifers in the unconsolidated rocks of the area are coarse sand and gravel deposits located predominantly along the stream valleys. The valleys of the Wabash and White Rivers contain the thickest and, therefore, the best unconsolidated rock aquifers. Yields from wells in these aquifers average 350 gpm with yields of as much as 1,000 gpm reported. Analyses of over 300 water samples indicate that the consolidated rocks of the area yield calcium bicarbonate, sodium bicarbonate, and sodium chloride water, and the unconsolidated rocks yield calcium bicarbonate water. (Woodard-USGS)
W74-04049

PHREATIC VS. VADOSE DIAGENESIS: STRATIGRAPHY AND MINERALOGY OF A CORED BOREHOLE ON BARBADOS, W.I.,
Brown Univ., Providence, R.I. Dept. of Geological Sciences.

R. P. Steinen, and R. K. Matthews.
Journal of Sedimentary Petrology, Vol 43, No 4, p 1012-1020, December 1972. 2 fig, 1 tab, 38 ref. NSF Grant GA-26102.

Descriptors: *Diagenesis, *Karst hydrology, *Limestones, *Mineralogy, Water circulation, Groundwater movement, Aqueous solutions, Karst, Water chemistry, *Stratigraphy.
Identifiers: *Barbados(W.I.).

Diagenesis involving meteoric water may take place in the vadose-subaerial environment or in the freshwater phreatic environment. Meteoric water diagenesis occurs more rapidly in the phreatic diagenetic environment. Continuous drill

core was recovered from a borehole in the reef tract on the south coast of Barbados, W.I. Carbonate sediments from the upper 1.5 m of the borehole have been in the vadose diagenetic zone since initial emergence from the depositional environment. These carbonate sediments are for the most part mineralogically unstable; they have not been affected by extensive dissolution. Freshwater phreatic lenses associated with high stands of sea level have occupied the pore systems of the sediments between 1.5 m and 15.3 m depth at least twice and possibly three times. Those zones occupied at least once by a fresh phreatic lens show complete mineral stabilization of the inter-coral matrix to low-Mg calcite, and extensive cementation and dissolution. Sediment from the lowest part of the core still retains most of its depositional mineralogy and shows only minor dissolution or cementation. This portion of the borehole has alternately been subjected to the vadose zone (during glacial low stands of the sea) and the marine phreatic zone (during interglacial high stands). Although the sediment from this borehole spent more time in the vadose diagenetic environment than all other environments combined, it is significant that only those portions of the borehole section once occupied by fresh phreatic pore fluids show extensive diagenetic modification. (Knapp-USGS)
W74-04068

EFFECT OF ADJACENT EXPANSIBLE FLUIDS AND CAPROCK LEAKAGE ON BUILDUP AND DRAWDOWN BEHAVIOR OF WELLS IN AN AQUIFER,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 4B.
W74-04152

EFFECTS OF PUMPING FROM THE OHIO RIVER VALLEY ALLUVIUM BETWEEN CARRICKTON AND GHENT, KENTUCKY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W74-04155

NUCLEAR SPIN-LATTICE RELAXATION OF LIQUIDS CONFINED IN POROUS SOLIDS,
Massachusetts Inst. of Tech., Cambridge.
S. D. Sutaria, and J. D. Robinson.
Society of Petroleum Engineers Journal, Vol 10, No 3, p 237-244, September, 1970. 1 tab, 9 ref.

Descriptors: *Porous solids, *Nuclear Magnetic Resonance, Water properties, *Pores, Mathematical models, Porosity, Diffusion, Wettability, Probability, *Measurement.

Identifiers: Relaxation time, Larmor precession frequency, Paramagnetic sites.

Previous investigators have observed that the spin-lattice relaxation time of water confined in a porous solid is shorter than in a large sample of water. Measurements were made of the proton relaxation time of bulk water and water contained in the pores of Selas porcelain cylinders having average pore radii of 2.2, 0.7 and 0.42 microns. Results of these measurements were used to guide the theoretical development. For the system water-Selas porcelain and for a single pore size in the range of petrophysical interest, the form of the spin-lattice relaxation was a simple exponential with the decay constant being a sum of two terms. The first term is the reciprocal of the relaxation time in the bulk liquid, while the second term represents the rate at which molecules diffuse to the pore surfaces and subsequently undergo surface relaxation. A random-walk, diffusion model was developed to account for the experimental observations. (Gray-NWWA)
W74-04157

WATER CYCLE—Field 2

Water In Soils—Group 2G

EVALUATION OF GROUNDWATER RESOURCES IN LIVERMORE VALLEY, CALIFORNIA, California Univ., Berkeley. Dept. of Civil Engineering.

P. A. Witherspoon.

Completion Report, UCAL-WRC-W-189, January 1971, 6 p, 5 ref. OWRR B-066-CAL(2).

Descriptors: *Groundwater movement, *California, Mathematical models, *Finite element analysis, Aquifer characteristics, *Sediments, *Alluvial aquifers, *Markov processes, Lithologic logs, Wells, Permeability. Identifiers: Livermore valley(Calif).

It was planned to use mathematical models in an effort to determine: (a) subsurface rates and directions of flow in the component parts of the basin, (b) effectiveness of existing hydrologic barriers, and (c) effect on subsurface flow patterns of current and future rates of recharge and discharge. A new numerical technique was developed that utilizes the finite element method in solving fluid flow problems in complex shaped aquifer systems with heterogeneous and anisotropic properties. Layers and lenses of these two types of sediments were distributed arbitrarily throughout two-dimensional cross-sections, and the hydrologic characteristics of the whole were studied using finite element methods. Emphasis was placed on trying to model the actual distribution of layers and lenses within the Livermore groundwater basin. In a few locations within the Livermore Valley, electric logs were available that provided good lithologic control in the upper 300 feet of sediments. By analyzing the lithologic types at fixed vertical intervals, it was possible to obtain one-step Markov transitions matrices for the 100 ft - 300 ft depth interval in eighteen wells. The matrices were then used to predict the vertical sequence of permeable and relatively impermeable sediments at each well location; it appears that a satisfactory method has been developed for predicting the vertical variation of alluvial sedimentation.

W74-04201

CHANGES IN STATISTICAL PROCESSING OF GROUNDWATER LEVEL MEASUREMENTS (WANDLUNGEN BEI DER STATISTISCHEN AUFBEREITUNG VON GRUNDWASSERSTANDMESSWERTEN), P. Sassenberg.

Deutsche Gewässerkundliche Mitteilungen, Vol 17, No 5, p 130-134, October 1973. 11 ref.

Descriptors: *Groundwater, *Water table, *Water levels, *Statistics, *Data processing, Electronic equipment, Measurement. Identifiers: *Germany.

Groundwater level measurements expressing the distance between measuring point and water table were used in statistical processing prior to necessary changeover to meters above mean sea level. Expansion of hydrological measuring networks and the need for faster, more reliable and comprehensive statistical processing of groundwater level measurements led to the use of data processing equipment. Limitations that had to be accepted as long as manual procedure and the punched card system were in use are described, and possibilities which data processing holds for statistical processing of groundwater level measurements are considered. (Josefson-USGS)

W74-04267

THE ROLE OF MOORS IN GROUNDWATER RECHARGE (DIE ROLLE DER MOORE BEI DER GRUNDWASSERNEUBILDUNG), Ausseninstitut fuer Moorforschung und Angewandte Bodenkunde, Bremen (West Germany). R. Eggelmann.

Deutsche Gewässerkundliche Mitteilungen, Vol 17, No 5, p 134-137, October 1973. 3 fig, 5 tab, 24 ref.

Descriptors: *Groundwater recharge, *Groundwater movement, *Bogs, *Peat, *Water balance, Evaporation, Runoff, Precipitation(Atmospheric), Permeability, Vegetation. Identifiers: *Germany, *Moors.

Information on groundwater recharge beneath different types of moors in northwestern Germany is deduced from water-balance data and from measured permeability of local peat. Groundwater discharge beneath swampy spruce stands is greater than beneath low moor, and groundwater discharge beneath low moor is greater than beneath high moor. Determined as equal to or less than 2 liters/sec/sq km, groundwater discharge is considerably lower than that of sand or gravel. (Josefson-USGS)

W74-04251

A NUMERICAL MODEL OF MULTIPHASE FLOW AROUND A WELL, Institut Francais du Petrole, des Carburants et Lubrifiants, Rue-Malmaison (France).

For primary bibliographic entry see Field 4B. W74-04258

EFFECTS OF THE FEEDER CANAL ON THE WATER RESOURCES OF THE FORT LAUDERDALE PROSPECT WELL-FIELD AREA, Geological Survey, Miami, Fla.

For primary bibliographic entry see Field 5G. W74-04259

VARIATION OF GROUNDWATER LEVELS AND A CALCULATION OF THE EFFECTIVE FISSURE POROSITY AT THE FILE HAJDAR, GOTLAND, Geological Survey of Sweden, Stockholm.

T. Fagerlund, and L. Nordberg. Geologiska Foreningens Forhandlingar, Vol 95, No 554, Part 3, p 317-327, September 30, 1973. 11 fig, 4 tab, 11 ref.

Descriptors: *Groundwater, *Water level fluctuations, *Porosity, *Recharge, *Evapotranspiration, Water levels, Aquifer characteristics, Hydrogeology. Identifiers: *Sweden(Gotland).

At File Hajdar on the island of Gotland, Sweden, Silurian limestones constitutes the main aquifer. Very large and rapid short-term fluctuations of the groundwater level have been recorded (25 m in less than a day). The annual amplitude is, in general, less than 30 m. The fluctuations, caused by precipitation and evapotranspiration, were used to calculate porosity. The effective fissure porosity of the limestone ranges from 0.06% to 0.47%. (Knapp-USGS)

W74-04260

ON SALTWATER HOT SPRINGS IN THE COAST AREA OF WESTERN ANATOLIA, TURKEY (UEBER SALZWASSER-THERMEN IM KUSTENLAND VON WEST-ANATOLIEN, TURKEI), Aegean Univ., Bornova (Turkey).

R. Brinkmann, and R. Kuhn. Chemical Geology, Vol 12, No 3, p 171-187, November 1973. 8 fig, 3 tab, 32 ref. English summary.

Descriptors: *Hot springs, *Water circulation, Sea water, Brines, Trace elements, Density, *Saline water. Identifiers: *Turkey(Anatolia).

The geological positions of 8 hot springs from the Karaburun coast, the Catalkaya Mountains, and

the Biga Peninsula, all situated in western Turkey, are described. The interpretation is based on chemical analyses of waters, especially the Br-, Rb- and D-contents. The hot springs from Karaburun and Catalkaya are mixtures of seawater and freshwater. The hot spring of Tuzlu in the Biga Peninsula discharges a mixture of seawater and brine originating either from a rock salt deposit or from oil fields. The temperature of the springs (21-91 C) suggests that seawater infiltrates to a depth of 2-3-1/2 km. The rise of the water above ocean level is explained by density differences between descending and rising water. (Knapp-USGS) W74-04270

2G. Water In Soils

AN EXPERIMENTAL STUDY OF SOIL WATER FLOW SYSTEMS INVOLVING HYSTERESIS, Colorado State Univ., Fort Collins. Dept. of Agronomy.

A. Klute, and R. W. Gilham.

Availability from NTIS as PB-227 236 \$3.00 in paper copy, \$1.45 in microfiche. Environmental Resources Center, Colorado State University, Fort Collins, Completion Report Series No 51, August 1973. 31 fig, 27 ref, append. OWRR A-014-COLO(2).

Descriptors: Flow, *Soil water, Unsaturated flow, *Hysteresis, Retention, Unsteady flow, Tensiometers, Tensile strength, *Hydraulic conductivity, *Measurement, *Pressure head, Nuclear moisture meters, Pressure measuring instruments. Identifiers: Tensiometry.

The hydraulic functions, i.e., hydraulic conductivity-water content and pressure head-water content relationships, were measured in an unsteady state flow situation on a column of sand using gamma absorption for water content measurements and pressure transducer tensiometry for pressure head measurements. Subsequently, the same flow column was subjected to a boundary condition that caused drainage and rewetting of the column. Measurements of pressure head, hydraulic head and water content versus time were made at various positions. These data were compared with the predictions from soil water flow theory which included the effects of hysteresis in the water content-pressure head relationship. Measured and predicted pressure head-time curves were in reasonable agreement, but measured and predicted water content-time curves were not always in good agreement.

W74-03760

EVALUATION OF WATER FLUX ABOVE A DEEP WATER TABLE USING THERMOCOUPLE PSYCHROMETERS, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

C. G. Enfield, J. J. C. Hsieh, and A. W. Warrick. Soil Science Society of America Proceedings, Vol 37, No 6, p 968-970, November-December 1973. 3 fig, 12 ref. AEC Contract 945-1-1830.

Descriptors: *Hygrometry, *Soil water movement, *Unsaturated flow, Instrumentation, Moisture content, Moisture meters. Identifiers: *Thermocouple psychrometers.

Deep water flow was evaluated in a Washington desert environment using hydraulic conductivity and potential gradients. Thermocouple psychrometers and temperature transducers were installed to depths of 94 m in the soil profile and used to measure the potential gradients. The hydraulic conductivity was calculated using a modified Millington and Quirk equation and the soil moisture characteristic curve. The thermal fluid diffusivity was calculated and used to estimate flow induced by thermal gradients. If flow existed at this location, it was less than 1 cm/year. (Knapp-USGS)

Field 2—WATER CYCLE

Group 2G—Water In Soils

W74-03776

SELF-DIFFUSION COEFFICIENTS OF SELECTED HERBICIDES IN WATER AND ESTIMATES OF THEIR TRANSMISSION FACTORS IN SOIL,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-03778

VACUUM EXTRACTORS TO ASSESS DEEP PERCOLATION LOSSES AND CHEMICAL CONSTITUENTS OF SOIL WATER,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 7B.
W74-03779

THE SIMULTANEOUS EFFECT OF PH AND CHLORIDE CONCENTRATIONS UPON MERCURY (II) AS A POLLUTANT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-03782

THE WATER-ICE PHASE COMPOSITION OF CLAY-WATER SYSTEMS: I. THE KAOLINITE-WATER SYSTEM,
Cold Regions Research and Engineering Lab., Hanover, N. H.
D. M. Anderson, A. R. Tice, and A. Banin.
Soil Science Society of America Proceedings, Vol 37, No 6, p 819-822, November-December 1973. 2 fig, 1 tab, 19 ref.

Descriptors: *Frozen soils, *Clay minerals, *Ice, *Soil moisture, Cryology, Adsorption, Freezing, Frost, Soil water, *Kaolinite, Clays, Frozen ground, Soil physical properties, Soil physics.

When water-ice phase composition curves are normalized to unit surface area, unfrozen water content values at all temperatures are higher for the kaolinite-water system than for other clay-water systems. In addition, the water-ice phase composition curve for this system is the resultant of the superposition of two power curves. Values of the unfrozen water content per unit surface area for the kaolinite-water systems are more than twice as large as those for the montmorillonite-water systems. Addition of polyethylene oxide to the kaolinite-water system had little effect on water content in the range of 0 to 1.7 but diminished water content significantly at values of more than 1.7. The observations are explained qualitatively in terms of a domain model of clay-imbibed water.
(Knapp-USGS)
W74-03783

WATER VAPOR MOVEMENT THROUGH MULCHES UNDER FIELD CONDITIONS,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.
B. A. Kimball.
Soil Science Society of America Proceedings, Vol 37, No 6, p 813-818, November-December 1973. 3 fig, 2 tab, 24 ref.

Descriptors: *Soil water movement, *Evaporation, *Diffusion, Lysimeters, Wettability, Soil physical properties, Mass transfer, Dispersion, Soil physics, Wetting, Soil surfaces, Air-earth interfaces, Water vapor.
Identifiers: *Mulches.

The loss of water vapor through 0.5-, 1-, and 2-cm depths of water repellent mulches was measured under field conditions with lysimeters. Measurements were made of wind velocities, air vapor pressures, and temperatures at the soil-mulch interfaces. Mulches used included 0.5-, 1-, and 2-mm glass beads and 1-mm glass bead aggregates. By assuming that the relative humidity of the soil air

at the soil-mulch interface was essentially 100%, effective diffusion coefficients for field conditions were calculated. The average effective diffusion coefficient for afternoon periods was 1.26 times greater than molecular diffusion coefficient. Little correlation was found between wind velocity and effective diffusion coefficient. (Knapp-USGS)
W74-03784

BEHAVIOR OF COHESIVE MATERIAL FROM A SOIL ENGINEER'S VIEWPOINT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-03798

THE HYDRAULICS OF ARTIFICIAL RECHARGE,
Technische Hogeschool, Delft (Netherlands).
For primary bibliographic entry see Field 4B.
W74-03820

NITRATE DETERMINATION BY A MODIFIED CONWAY MICRODIFFUSION METHOD,
Agricultural Research Service, Beltsville, Md.
Plant Physiology Inst.
G. Stanford, J. N. Carter, E. C. Simpson Jr., and D. E. Schwaninger.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1365-1368, November 1973. 1 fig, 3 tab, 8 ref.

Descriptors: *Nitrates, *Soil analysis, *Ammonium, Nitrogen, Water analysis, Pollutant identification.

Identifiers: Conway microdiffusion method, Sample preparation, Chemical interference, Recovery.

The proposed modified Conway microdiffusion method provides for consecutive determinations of NH4- and NO3-N in a given aliquot of soil extract. Analysis is performed by pipetting soil extract into the peripheral chamber of an Obrik-Conway microdiffusion dish, pipetting boric acid solution into the center well, adding K2CO3 to the outer moat and the sample chamber of the dish, and sealing the dish with the cover. After 16 hrs or more the diffused NH4N is titrated. Devarda's alloy is then added to the sample chamber, and NO3 N is titrated after 16 hrs or more. To measure (NH4plus)NO3-N, Devarda's alloy is added to the sample chamber first. Analyses of primary nitrate standards showed essentially complete recovery in the range of 1 to 20 ppm NO3-N (4 to 80 micrograms N/aliquot). Results for (NH4plus)NO3-N and NO3-N in soil extracts are comparable to those obtained, respectively, by macrodistillation with Devarda's alloy and the phenoldisulfonic acid colorimetric method. The method is rapid and suitable for routine analyses of soil extracts, the equipment is inexpensive, and no interferences are apparent. (Little-Battelle)
W74-03845

INVESTIGATION OF THE DYNAMICS OF THE MOISTURE STATE OF THE SOIL UNDER SEVERAL YEARS OF FORAGE CROPS AND UNDER SAINFOIN, (IN CZECH),
Vyzkumny Ustav Rastlinnej Vyroby, Piestanoch (Czechoslovakia).
For primary bibliographic entry see Field 3F.
W74-03917

INTEGRATING NATURAL RESOURCES INTO AREAWISE AND LOCAL PLANNING: THE SOUTHEASTERN WISCONSIN EXPERIENCE,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 6B.
W74-03965

WATER RENOVATION FOR UNRESTRICTED RE-USE,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-04034

SOIL MOISTURE TRENDS ON SAGEBRUSH RANGELANDS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
W. J. Rawls, J. F. Zuzel, and G. A. Schumaker.
Journal of Soil and Water Conservation, Vol 28, No 6, p 270-272, November-December 1973. 4 fig, 1 tab, 5 ref.

Descriptors: *Soil moisture, *Grasslands, *Water storage, Seasonal, *Idaho, Soil water, Evapotranspiration, *Sagebrush, *Range management.

In 1966 and 1967 three networks of soil moisture access tubes were established on Idaho's Reynolds Mountain Watershed, a mountainous area near Boise with elevations from 3,600 to 7,200 feet. These networks represent a range of soils, elevations, and precipitation zones. Biweekly monitoring with a neutron soil moisture probe allowed the derivation of an average annual soil moisture curve for the top 3 feet of soil in each area. These curves showed that maximum soil moisture accumulation occurred in late February at the low elevations and in late May at the high elevations. Minimum soil moisture occurred in July and August. Maximum soil moisture accumulation varied from 8 to 18 inches of water. The depletion rate between minimum and maximum soil moisture was approximately linear with a total depletion of 2.5 to 4 inches of water. (Knapp-USGS)
W74-04074

EFFECT OF ENVIRONMENTAL FACTORS ON ALGAE COUNT IN THE MAIN SOIL TYPES OF THE ESTONIAN SSR (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tallinn. Inst. of Experimental Biology.
H. Riis.

Eesti Nsv Tead Akad Toim Biol, Vol 21, No 3, p 199-206, 1972, Illus, English summary.
Identifiers: *Algae count(Soils), Environmental studies, Shale oil, *Soil treatment, *USSR(Estonian-SSR), *Soil moisture, Soil temperature.

The soil algae count and its dependence on various factors (moisture and temperature of the soil, treatment with shale oil and its components) were determined in regard to the main soil types of the Estonian SSR over a 2 yr period. Soil samples were taken the year round from 14 biometers. Soil moisture and temperature affect the count of soil algae either directly or indirectly. It appears that the count was more strongly affected by moisture. A moisture content of about 25-45% is most favorable for the development of soil algae. The algae count of the examined soil types did not decrease in accordance with low temperature (-4.3 to 5 deg C). With rising temperature the count decreased constantly, reaching its minimum at about 10-17.8C, according to the soil type. The treatment of soils with shale oil (1 ton/ha) and its components (0.5 ton/ha) had no effect on the algae count.—Copyright 1973, Biological Abstracts, Inc.
W74-04114

GROSS CHEMICAL COMPOSITION OF MURGAB OASIS DESERTIFIED AND ANCIENT-IRRIGATION SOILS (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W74-04123

SEASONAL VARIATIONS OF THE SALINITY IN SOME PROFILES AND IN THE WATER

WATER CYCLE—Field 2
Lakes—Group 2H

TABLE OF THE SODIC SOILS OF CAMARGUE: PRELIMINARY RESULTS (IN FRENCH),
Institut National de la Recherche Agronomique,
Montpellier (France). Service d'Etude des Solos.
J. Servant.

Bull Assoc Fr Etude Sol. 6, p 23-31, 1971, Illus.
English summary.

Identifiers: Absorption, Arthrocnemum, Electrical conductivity, *France(Camargue), Salicornia, Salinity, *Seasonal, Sodium, *Soils(Sodic), Soil profiles, Water table, Saline soils, Halophytes.

The soils were situated in Camargue, between the Rhone River and Vaccares pond, in southern France. They corresponded to the saline spots being developed in the cultivated zones where the plants are stunted or absent. A profile was studied in 'Sansouire' which is very saline zone exclusively colonized by halophytes (Arthrocnemum, Salicornia). In the sector concerned (Mas du Grand Manusclet) 5 saline spots and a spot in the Sansouire were selected. The soils and the water tables were sampled 6 times during a period from Nov. 1970 to Sept. 1971. The specific characteristics of saline spots are given and the changes in the salinity during the year are shown. Correlations were established between the electrical conductivity and sum of anions as well as between the sodium adsorption ratio and sum of anions. The mean annual values, with their standard deviations, were found, and calculation of the coefficients of the variation characterized the fluctuations of salinity and alkalinity. The coefficients of variation were higher in less saline soils as compared to the highly saline soils.—Copyright 1973, Biological Abstracts, Inc.

W74-04124

APPRECIATION OF THE FITNESS FOR UTILIZATION OF THE SOILS OF PROVENCE, G. Duclos.

Bull Assoc Fr Etude Sol. 6, p 33-46, 1971, Illus.

Identifiers: Exchange capacity, *France(Provence), Moisture, Nitrogen, Phosphorus, Potassium, *Soils, *Mapping, Hydrogen ion concentration.

The factors on which the fitness of soils for utilization depend are depth of the loose soil in the root zone, texture and granulometry, pebble content, limestone content and the potential fertility which includes pH, organic matter, N, P, and K, and the total exchange capacity. The reserve of readily utilizable water, internal drainage and factors of relief, topography and climate are described. Soils are put in 7 classes by their favorable or unfavorable characteristics and various types of soils in Provence are described and classified. The aptitude of these classes for cultivation is described. A map is given with the classes of soil indicated and also the various limitations such as salinity, active limestone, erosion, slope and texture.—Copyright 1973, Biological Abstracts, Inc.

W74-04125

DRY LAND RESEARCH IN NORTHWEST INDIA. I: EFFECT OF VARIABLE PRE-PLANTING TILLAGE ON SOIL MOISTURE, GROWTH, AND YIELD OF PEARL MILLET (PENNISETUM TYPHOIDES, S. AND H),
Haryana Agricultural Univ., Hissar (India). Dept. of Agronomy.

For primary bibliographic entry see Field 3F.

W74-04128

SELECTING A METHOD FOR SCHEDULING IRRIGATION, USING A SIMULATION MODEL,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 3F.

W74-04134

GRAIN SORGHUM RESPONSE TO TRICKLE AND SUBSURFACE IRRIGATION,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.

W74-04137

MOVEMENT OF NITRATES UNDER IRRIGATED AGRICULTURE,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
For primary bibliographic entry see Field 5B.

W74-04139

GYPSUM AS IMPROVER OF THE PERMEABILITY OF GRUMUSOL (TYPIC PELLUSTERT) IN THE KANO PLAINS OF KENYA,
National Agricultural Research Lab., Nairobi (Kenya).

N. N. Nyandat.

E Afr Agric For J. Vol 38, No 1, p 1-7, 1972. Illus.
Identifiers: Electrolytes, *Grumusol, *Gypsum, *Kenya(Kano Plains), Moisture, Mulching, *Permeability, Plains, Sodium, Typic pellustert.

The effect of initial moisture content, rate of wetting, soil electrolyte concentration, and the level of exchangeable Na on the usefulness of gypsum as improver of permeability was examined for a grumusol. The improvement of permeability seems to be most effective at a moisture tension around 1 atm and when the soil is slowly wetted. Field incorporation of gypsum may therefore seem to require that it be applied when the soil is not too moist and not too dry and that following application the soil be protected from direct impact of large rain drops by mulching. The beneficial effect of gypsum on the soils under consideration appears to depend on maintaining the soil electrolyte concentration at a level above 11.52 me/l gypsum solution. Also the effect does not lead to a permanent improvement of permeability or a permanent stabilization of the structure of the soil. Once the soil is depleted of salt, reapplication of gypsum does not restore permeability to adequate level. The application of gypsum on these soils therefore should be continual and should be done before the soil electrolyte becomes too dilute. Gypsum is effective even when the soils contain high levels of exchangeable Na. The effect of exchangeable Na, however, appears uniform at levels above 5.4% and there does not seem to be a correlation between exchangeable Na percentage and permeability.—Copyright 1973, Biological Abstracts, Inc.

W74-04193

DRAINAGE DESIGN AS INFLUENCED BY CONDITIONS IN THE VICINITY OF THE DRAIN LINE,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4A.

W74-04200

DIVISION OF THE CISBAYKAL REGION INTO ZONES ON THE BASIS OF MOISTURE AND HEAT AVAILABILITY (RAYONIROVANIYE TERRITORII PREDBAYKAL'YA PO STEPENI UVLAZHNENIYA I TEPOOBESPECHEN-NOSTI),
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).

N. S. Berkin.

Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 32, p 33-40, 1971. 1 fig, 1 tab, 19 ref.

Descriptors: *Moisture, *Moisture availability, *Heat, Heat balance, Seasonal, Water balance, Precipitation(Atmospheric), Evaporation, Runoff, Water storage, Equations, Maps.

Identifiers: *USSR(Cisbaykal region).

Division of the Cisbaykal region into zones was based on analysis of space-time distribution of water- and heat-balance items and of various heat- and moisture-availability indices computed for 110 points in the Irkutsk Oblast and the southwestern part of Buryat ASSR. Maximum moisture is observed in April when the soils are wetted by snow waters. In May-June, moisture content decreases as a result of a sharp increase in heat supplies. An increase in moisture content during the second half of summer due to rainfall continues until spring of the following year. Maximum values of moisture- and heat-availability indices occur in mountainous regions where a precipitation excess and heat deficiency are observed. Minimum values occur in forested steppe and steppe regions where there is a moisture deficit. Two hydrologic-climatic zones are distinguished in the region: (1) the zone of abundant moisture, covering 37% of the region; and (2) the zone of optimal moisture, covering 63% of the region and including a small zone of moisture deficit. (Josefson-USGS)

W74-04254

A LANDSCAPE ZONATION FOR THE SOUTHERN AND CENTRAL MACKENZIE RIVER VALLEY BASED ON TERRAIN PERMAFROST CHARACTERISTICS,
Northern Forest Research Center, Edmonton (Alberta).

For primary bibliographic entry see Field 2C.

W74-04266

SPECTROPHOTOMETRIC DETERMINATION OF HEXACHLOROBUTADIENE (HCBD) IN SOIL AND WATER, (IN RUSSIAN),
Akademiya Nauk Moldavskoi SSR, Kishinev.
For primary bibliographic entry see Field 5B.

W74-04293

2H. Lakes

WATER BALANCE OF A SMALL LAKE IN A PERMAFROST REGION,
Alaska Univ., College. Inst. of Water Resources.

C. W. Hartman, and R. F. Carlson.

Availability from NTIS as PB-227 241 \$3.00 in paper copy, \$1.45 in microfiche. Report No IWR-42, September 1973, 23 p, 7 fig, 2 tab. OWRR A-031-ALAS(4). 14-01-0001-3002.

Descriptors: Climates, *Alaska, Cold regions, *Groundwater, *Lakes, Hydrologic budget, *Drawdown, *Permafrost, *Water balance, Peat, Arctic.

Identifiers: *Fairbanks(Alas), Sub-permafrost, Pumped drawdown.

Lakes form an important water resource in arctic permafrost areas. Although normal groundwater flow in permafrost areas is confined to the active layer, potential interconnections exist between lakes and the underlying sub-permafrost groundwater aquifer. The existence of these interconnections was examined by pumping water from a small thaw lake near Fairbanks, Alaska. The induced drawdown allowed study of the dynamics of the active layer surrounding the lake and determination of the amount of groundwater recharge into the lake. The drawdown tests indicated that there is little hydraulic connection between the lake and the sub-permafrost groundwater system. The lake probably routinely fills with water during the spring runoff and is controlled throughout the summer season by rainfall, evaporation and from a small amount of recharge from the shallow peat layer surrounding the lake after intense rainstorms.

W74-03758

A FEASIBILITY STUDY OF A RESEARCH PROGRAM ON THE SOURCE, DEGRADATIVE

Field 2—WATER CYCLE

Group 2H—Lakes

REMOVAL AND SECONDARY CONSEQUENCES OF PETROLEUM PRODUCTS IN WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-03767

TROPHIC LEVEL INTERRELATIONSHIPS IN CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.

D. G. Hennick, W. D. Youngs, and R. T. Oglesby.
Availability from NTIS as PB-227 233 \$4.00 in paper copy, \$1.45 in microfiche. Technical Report 75, November 1973. 85 p, 6 fig, 8 tab, 22 ref, 8 append. OWRR A-041-NY(1). 14-31-0001-382.

Descriptors: *Trophic level, *Zooplankton, Data collections, *Biomass, *Lakes, *Growth rates, Water resources, Fish food organisms, Seasonal, Population, Forage fish.
Identifiers: *Alewives, *Lake Cayuga(NY), Finger Lakes(NY), Clupeids.

Presented are the results of a research investigation of the relationship of alewife growth rate and foraging effort to zooplankton standing crop. Data were collected from Lake Cayuga, New York and consisted of length-frequency measures of alewives and zooplankton, and catch per unit of alewives. Alewife samples were caught in specially designed experimental gill nets. Seasonal variance in the growth rate of yearling alewives in Cayuga Lake can be accounted for solely by fluctuations in food supply; growth rate is not affected by summer range temperatures. Evidence from both gill net catch per unit effort, and the relationship between alewife growth rate and zooplankton concentration indicated that alewife foraging effort is proportional to food supply. Zooplankton standing crop is a vital measure of the food supply of alewives. (Bell-New York)
W74-03769

DISTRIBUTION OF ZR, TI, NI, CO, PB, CU, AND OTHER ELEMENTS IN THE SURFACE LAYER OF RECENT SEDIMENTS OF LAKE BALKHASH (RASPREDELENIYE ZR, TI, NI, CO, PB, CU I DRUGIHK ELEMENTOV V POVERKHINSTOM SLOYE SOVREMENNYKH OSO DKOV OZ. BALKHASH),
Adademiya Nauk SSSR, Moscow. Geologicheskii Institut.
D. S. Turovskiy, I. Yu. Lubchenko, and Ye. V. Cherkasova.
Litologiya i Poleznye Iskopayemye, No 1, p 47-55, January-February 1973. 3 fig, 2 tab, 7 ref.

Descriptors: *Lake sediments, *Bottom sediments, *Recent epoch, *Trace elements, *Metals, Chromium, Titanium, Iron, Manganese, Cobalt, Nickel, Lead, Copper, Molybdenum, Phosphorus, Calcium carbonate, Silts, Sands, Maps.
Identifiers: *USSR(Lake Balkhash), Ili River, Oozes, Zirconium, Gallium, Vanadium, Germanium, Organic carbon.
W74-03832

The composition of suspended material carried into Lake Balkhash by the Ili River includes Zr (0.032%), Ti (0.42%), Cr (0.007%), V (0.0106%), Fe (3.6%), Mn (0.07%), Co (0.0015%), Ni (0.0029%), Cu (0.0037%), Pb (0.0043%), P (0.096%), Ga (0.0017%), Ge (0.0001%), and Mo (0.00007%). These elements are divided into four groups according to areal distribution and accumulation in different sediment types. The first group consists of the geochemically least mobile elements Zr and Ga. The second consists of V, Cr, Ti, and probably, Ge. The third group is composed of Fe, Mn, Co, Ni, Pb, Cu, and P—the geochemically most mobile elements. The fourth group consists of Mo and organic C. Bottom sediments of the lake are divided into medium-grained sands, fine-grained sands, coarse silts, fine silty calcareous

and calcareous-dolomitic oozes, and silty-pelitic calcareous and calcareous-dolomitic oozes. Fine silty and silty-pelitic oozes are rich in Fe, P, Mn, Co, Ni, Cu, and Pb. Zr is accumulated in littoral zones composed of sands. Ti, V, and Cr concentrations are highest in sediments consisting of coarse silts and fine silty oozes. The relation between the distribution of elements and the hydrodynamic regime of the lake basin is mapped. (Josefson-USGS)
W74-03827

LAKES OF THE BOL'SHOY PATOK RIVER BASIN (NORTHERN URALS). THEIR IMPORTANCE AND PRESERVATION (OZERA BASSEYNA R. BOL'SHOY PATOK (PRIPOLYARNYY URAL), IKH ZNACHENIYE I OKHRANA),
L. P. Goldina.

Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 5, p463-465, September-October 1973. 6 ref.

Descriptors: *Lakes, *Lake morphometry, Lake morphology, Lake shores, *Lake basins, Lake beds, Lake fisheries, Thermal properties, Water quality, Tourism.
Identifiers: *USSR(Komi ASSR), Bol'shoy Patok River, Mineralization.

To obtain more complete data on lakes formed in mountainous terrain, limnological investigations were carried out in the summer of 1972 in the Bol'shoy Patok River basin in the Komi ASSR. Morphometric parameters were determined for 3 mountain lakes: Sigovoye, Lesnoye, and Podgornoye. For Lake Sigovoye, the surface area is 0.2 sq km; mean depth is 7.4 m; maximum depth is 27.3 m; volume is 1.4 million cu m; and shoreline length is 2.5 km. For Lake Lesnoye, the surface area is 0.2 sq km; mean depth is 6 m; maximum depth is 24 m; volume is 1.3 million cu m; and shoreline length is 2.5 km. For Lake Podgornoye, the surface area is 0.3 sq km; mean depth is 4.3 m; maximum depth is 14.0 m; volume is 1.4 million cu m; and shoreline length is 1.8 km. Lakes Sigovoye and Lesnoye are similar in hydrochemical characteristics. The reaction of water of both lakes is weakly acidic (pH 6.9-7.0). Total hardness is 0.53-0.63 meq/liter. Waters of both lakes have a relatively low mineralization (4.62-6.38 mg/liter), and their chemical composition is of the sodium-sulfate type. Reaction of water of Lake Podgornoye is acidic (pH 6.0-6.3). In hardness characteristics, the lake water is classified as soft. The water has a low mineralization (3.64 mg/liter), and its chemical composition is of the sodium-sulfate type. The importance of these lakes for the fishery economy and tourism is noted. (Josefson-USGS)
W74-03843

IRON ORE IN LAKES OF VOLOGDA OBLAST (ZHELEZORUDNYYE OZERA VOLOGODSKOY OBLASTI),
G. A. Vorob'yev.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 2, p 170-174, March-April 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Limnology, *Lakes, *Iron, *Iron compounds, *Iron oxides, Oxides, Lake morphometry, Thermal properties, Thermal stratification, Bottom sediments, Maps.
Identifiers: *USSR(Vologda Oblast), *Iron ore.

Limnological investigations were conducted in the summer of 1971 in Vologda Oblast in north-central Soviet Russia to determine ore formation in 6 lakes of the Shimozero group and in Lake Lozko-Azatskoye. Iron ores were discovered in bottom sediments of 3 lakes of the Shimozero group—Shimozero, Maslozero, and Yandozero. Fe203 concentrations in concretions are high, varying between 47.0% and 67.4%. Low MnO concentrations (0.24%-0.87%) and comparatively high P205

concentrations (3.07%-4.25%) in the iron formations are not representative of iron-ore formations in lakes of Scandinavia or the Karelian Isthmus. In the southern part of Lake Lozko-Azatskoye, iron ores were observed in sandy-gravelly deposits at a depth of 2-4 m. Concretions contain 47.00%-67.40% Fe203, 4.00%-5.50% SiO2, 0.70%-1.26% CaO, less than 0.10% MgO, 3.04%-3.73% P205, 0.82%-0.87% MnO, and 0.02%-0.08% TiO2. The concretions are similar in composition to iron-ore formations in the Shimozero group of lakes. (Josefson-USGS)
W74-03833

ZONATION OF AQUATIC AND SWAMP VEGETATION, (IN RUMANIAN),
Bucharest Univ. (Rumania).
G. A. Nedelcu.

An Univ. Bucur Biol Veg. 20 p 193-201. 1971, Illus.
Identifiers: Aquatic plants, Forest, Romanian, *Swamp vegetation, *Zonation.

Studies were made of the zonation of aquatic and swamp vegetation of the Romanian lowlands. A system of 3 zones is presented: pelagic zone with a trophogenic and tropholytic area, the littoral zone with water, semiaquatic and shore belts, the border or forest zone with mesophilic meadows and shore forests. Examples of aquatic and swamp vegetation are given for each zone.—Copyright 1973, Biological Abstracts, Inc.
W74-03843

A STUDY OF MERCURIALS IN THE ELEPHANT BUTTE RESERVOIR ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.

For primary bibliographic entry see Field 5C.
W74-03899

MONTEZUMA WELL, ARIZONA, AS A HABITAT,
Arizona State Univ., Tempe.
W. T. Barry.

Journal of the Arizona Academy of Science, Vol 8, No 1, p 7-13, February 1973. 4 fig, 2 tab, 5 ref. NSF Grants 13161 and GB-154.

Descriptors: *Lake bottom springs, *Aquatic habitats, *Water temperature, *Lake sediments, Water chemistry, *Lake beds, Springs, Bodies of water, Biomes, Limestones, Karst, Karst hydrology, Sinks, Land subsidence, *Arizona.
Identifiers: Montezuma Well(Ariz).

This study examines Montezuma Well, a deep limestone lake in a semi-arid environment in Yavapai County, Arizona, as a biological habitat. The lake has an area of 0.76 ha and a maximum depth of 17 m, excluding water inlet fissures which are at least 42 m deep. Water enters through these fissures at anywhere between 4,150 to 7,300 cubic meters per day. Influent water was found to be at an almost constant 24 degrees C. Samples were not turbid, although mean Secchi disc transparency is 3.02 m at the level where 80 percent incident radiation has been absorbed. Calcium bicarbonate and sodium chloride are the predominant ions in solution. The pH ranges from 6.2 to 6.9, implying a free carbon dioxide level from 135 to 690 mg/l. This gas entering with the influent water is responsible for the striking anomalies (circa 25,000 BP) in radiocarbon dates from modern plants from within the well. (Muller-Arizona)
W74-03925

A COMPARATIVE STUDY OF PLANKTON RESPIRATION IN AN ACID POLLUTED LAKE AND ITS ACID FREE EMBAYMENTS,
West Virginia Univ., Morgantown. Dept. of Biology.

For primary bibliographic entry see Field 5C.
W74-03935

WATER CYCLE—Field 2

Lakes—Group 2H

AN ECOLOGICAL EVALUATION OF A THERMAL DISCHARGE. PART II: THE DISTRIBUTION OF PHYTOPLANKTON AND PRIMARY PRODUCTIVITY NEAR THE WESTERN SHORE OF LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-03936

LAKE KINNERET: PLANKTONIC POPULATIONS DURING SEASONS OF HIGH AND LOW PHOSPHORUS AVAILABILITY,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W74-03937

SOME ENVIRONMENTAL FACTORS DETERMINING THE PRIMARY PRODUCTION OF THE MOZHAISK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W74-03939

SPECIES DIVERSITY OF CHYDORID FOSSIL COMMUNITIES IN THE MISSISSIPPI VALLEY,
Wayne State Univ., Detroit, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-03941

PRIMARY PRODUCTION AND DESTRUCTION OF ORGANIC MATTER IN 2 LAKES OF DIFFERENT TYPES, (IN RUSSIAN),
Gorkii State Univ. (USSR). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-03944

PROTEOLYTIC ACTIVITY OF SAPROPHYTIC MICROFLORA IN THE DNEPRODZERZHINSKOE RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W74-03949

THE BIOLOGY OF PIKE PERCH IN THE ARNASAYA LAKES SYSTEM, (IN RUSSIAN),
Tashkent Univ. (USSR).
N. M. Khalmatov.
Uzb Biol Zh. Vol 16, No 6, p 56-58. 1972.
Identifiers: Biology, Feeding, Lake systems, *Perch(Pike), *Spawning, *USSR(Arnasaya).

A morphological and biological study of pike perch in the Arnasaya lakes system, USSR, is presented. The perch spawns in April of the second and third year. They use the coastal zones as a spawning ground. The yield is high (66, 840-1,018,500) eggs depending on the length and the weight of the fish. It feeds on small and trash fish and occasionally eats its compatriots. Often bits of shrimp are found in the digestive tract.—Copyright 1973, Biological Abstracts, Inc.
W74-03961

ROTIFER PLANKTON IN BRACKISH AND FRESHWATER LOCALITIES IN CENTRAL SWEDEN,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W74-04041

DEVELOPMENT OF THREE-DIMENSIONAL NUMERICAL MODELS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
T. J. Simons.

Canada Department of Environment, Inland Waters Directorate Scientific Series No 12, 1973. 26 p, 9 fig, 1 tab, 63 ref.

Descriptors: *Water levels, *Great Lakes, *Water circulation, *Water temperature, Model studies, Mathematical studies, Numerical analysis, Weather data, Weather forecasting, Storms, Winds, Lake morphology.

A generalized numerical model is described for computing the water levels and the three-dimensional circulation and temperature structure of the Great Lakes. The mathematical-numerical framework is borrowed from numerical weather prediction, storm surge forecasting, and ocean circulation models. In view of the prominence of the boundary-value problem in the modeling of relatively shallow basins, emphasis is placed on the proper treatment of the bottom topography. The model is based on the hydrostatic and the Boussinesq approximations and employs a quadratic relationship between temperature and density anomalies. The equations for the layered system are derived by vertical integration over layers and by defining new vertical velocities relative to the interfaces. Thereby the model allows for rigid horizontal levels, sloping permeable interfaces, moving material interfaces, or any combination of these. The formulation of the finite-differencing scheme is based on considerations of the energy balance of the physical system, and accuracy and economy of numerical computations. The problems of grid dispersion and the treatment of lateral boundaries are investigated with the help of an exact solution obtained for the response of a lake to a time-dependent wind stress simulating the passage of an atmospheric front. (Woodard-USGS)
W74-04051

PRIMARY PRODUCTIVITY IN RELATION TO CHEMICAL PARAMETERS IN CHEAT LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-04089

DEPENDENCE OF THE GROWTH OF WHITE BREAM AND GOLDFISH ON ENVIRONMENT, (IN BYELORUSSIAU),
T. M. Shawtsova.
Vyestki Akad Navuk B SSR Syer Biyal Navuk. No 5, p 100-103. 1972.
Identifiers: Environment, Food *Goldfish, *Growth, Season, Temperature, *White bream.

Data on the age composition of catches of white bream and goldfish are presented. The growth of bream by ages, seasons, generations, periods, and bodies of water are given. The effect of abiotic (temperature, water level) and biotic (numbers) factors of the environment on the growth of bream was noted. The growth of goldfish in lakes with different environmental conditions is analyzed. Growth is governed by numbers and food base.—Copyright 1973, Biological Abstracts, Inc.
W74-04090

DIET OF THE MESOCYCLOPS LEUCKARTI (CLAUS) AND LEPTODORA KINDTII (FOCKE) POPULATIONS IN LAKE ILMEN, (IN RUSSIAN),
Gosudarstvenny Nauchno-Issledovatel'skii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
L. A. Stepanova.
Gidrobiol Zh. Vol 8, No 3, p 90-92. 1972. Illus.
Identifiers: Bosmina-coregoni, Chydorus-sphaericus, Daphnia-cucullata, Diet, Eudiaptomus-graciloides, Lakes, *Leptodora-kindtii, *Mesocyclops-leuckarti, Productivity, Sida-crystallina, *USSR(Lake Ilmen).

Daily consumption of *Daphnia cucullata*, *Bosmina coregoni*, *Chydorus sphaericus*, *Sida crystallina* and *Eudiaptomus graciloides* by *M. leuckarti* and *L. kindtii* was studied under laboratory conditions.

When the biomass of zooplankton was increased from 0.12-0.36 g/m³, the daily consumption of *M. leuckarti* increased from 10 to 31% of wet weight; further increases to 0.60 g/m³ caused a slight increase to 34%, which was the highest value observed. The intake of *L. kindtii* reached a peak at a concentration of 0.36 g/m³ and 20% of wet weight. The productivity of organisms in the first and second trophic levels is calculated for Lake Ilmen (USSR) using these data.—Copyright 1973, Biological Abstracts, Inc.
W74-04091

RESULTS OF ACCLIMATIZATION OF COROPHIUM SOWINSKYI (MART.) IN THE VESELOVSK RESERVOIR, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR). Research Inst. of Biology.

V. M. Kruglova, E. M. Reikh, and L. N. Tapil'skaya.
Gidrobiol Zh. Vol 8, No 5, p 83-86. 1972.
Identifiers: *Acclimatization, *Corophium-sowinskyi, Fish forage, Reservoirs, *USSR(Veselovsk reservoir).

The crustacean *Corophium sowinskyi* successfully acclimated in the Veselovsk reservoir (USSR), enriching the food base of areas previously extremely impoverished and completely unsuitable for fish foraging. The results of introducing the crustacean in the Veselovsk reservoir give grounds for recommending it for acclimatization in other bodies of water.—Copyright 1973, Biological Abstracts, Inc.
W74-04099

A MEROMICTIC LAKE IN AUSTRALIA,
Monash Univ., Clayton (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-04101

A PROGRAMME FOR STUDIES OF THE RECOVERY OF POLLUTED LAKES. THE EFFECT OF CHEMICAL SEWAGE TREATMENT AND DIVERSION OF SEWAGE,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5C.
W74-04105

THE FEEDING OF CARASSIUS AURATUS GIBELIO BLOCH FROM KAIRAKKUM RESERVOIR, (IN RUSSIAN),
Akademii Nauk Tadzhikskoi SSR, Dushanbe. Institut Zooligii i Parazitologii.
L. V. Kondr.
Dokl Akad Nauk Tadzh SSR. Vol 15, No 10, p 50-53. 1972. Illus.
Identifiers: Algae, *Carassius-auratus-gibbelio, *Feeding, Reservoirs, Silt, *USSR(Kairakkum reservoir), Chlorophyta.

The food content of 33 intestines of *C. auratus gibbelio* fish from Kairakkum reservoir, USSR, was studied. The species varied in length, 20-39 cm, and 9 of them were found with empty intestines. Ten food components were found, mostly green algae, detritus and silt.—Copyright 1973, Biological Abstracts, Inc.
W74-04109

EXPERIMENT IN COMPUTING THE TOTAL PRODUCTION OF ZOOPLANKTON USING URAL LAKES AS AN EXAMPLE (IN RUSSIAN),
Siberian Research Inst. of Pisciculture, Tyumen (USSR).
I. V. Kozlova.
Gidrobiol Zh. Vol 8, No 3, p 130-134. 1972. Illus.
Identifiers: Cladocera, Cyclops, Diaptomids, Fish food, Lakes, Predators, *Production, Protozoa, Rotifers, *Zooplankton, Distribution, *USSR(Ural lakes).

Field 2—WATER CYCLE

Group 2H—Lakes

This method of computation involves distribution of all groups of non-predatory zooplankton in the diet of predators according to their production and excludes from real production that portion of protozoan production which is not used by predators. The production of non-predatory zooplankton included that of protozoa, rotifers, Calanidae and diaptomids; the production of predators included that of cyclops, predatory Calanidae and predatory rotifers. This method permitted reliable calculation of the food base of plankton-eating fish. Values for 6 lakes in the Urals, USSR were computed.—Copyright 1973, Biological Abstracts, Inc.
W74-04120

THE MOLLUSK FAUNA OF THE BOLSHOI KARABULAK OXBOW LAKE (VOLGA DELTA), (IN RUSSIAN),
V. V. Pirogov.
Gidrobiol. Zh. Vol. 8, No 6, p 88-96. 1972. Illus. (English summary).
Identifiers: Desiccation, Lakes, *Mollusk fauna, Oxbow lakes, *Valvata-Piscinalis, Volga delta, *USSR(Bolshoi Karabulak lake), Bottom fauna, *Benthos.

The bottom fauna of the Bolshoi Karabulak oxbow lake (USSR) was studied periodically 1.0m 1916. The last observations were conducted in 1960. Since then, the oxbow lake developed into the next stage and became the valvate type, with dominance of Valvata piscinalis (Muller) in its benthos. Totally 19 mollusk species were found in the lake's back-waters. Three of them are autochthonous, and easily survive 11 mo. unfavorable drying. They do not occur in every lake.—Copyright 1973, Biological Abstracts, Inc.
W74-04165

PRIMARY PRODUCTIVITY IN THE CRAPINA-JIJILA LAKE-COMPLEX (DANUBE FLOODED AREA) DURING SEVERE FLOODING,
Bucharest Univ. (Rumania). Faculty of Biology.
For primary bibliographic entry see Field 5C.
W74-04194

FEEDING AND FOOD RELATIONSHIPS OF THE TROUT SALMO ISCHCHAN KESSLER AND WHITEFISH COREGONUS LAVARETUS LUDOGA POLIAKOW OF LAKE SEVAN, (IN RUSSIAN),
S. A. Pivazyan.
Vopr Ikhniol. Vol 12, No 6, p 1086-1093. 1972.
Identifiers: Amphipods, Coregonus-Lavaretus-Ludoga, Lakes, Plankton, Salmo-Ischchan, Seasonal, *Trout, *USSR(Lake Sevan), *Whitefish, Zooplankton, *Food fish.

Feeding of the trout S. ischchan and whitefish C. lavaretus ludoga under conditions of the continuing lowering of the waters of Lake Sevan (USSR) was studied. An appreciable similarity of the feeding of the trout and whitefish was noted during the spring-summer feeding period, when the fishes consume mainly amphipods. As the amphipods are consumed the role of other benthic organisms increases in the feeding of the trout and the value of zooplankton increases for the whitefish. During the fall and winter the stress of food relations between whitefish and trout decreases in connection with the change of whitefish to feeding almost exclusively on zooplankton. Broadening of the food spectrum of these fishes indicates deterioration of their forage conditions, which occurred as a result of changes of the food base and marked increase of number of whitefishes in connection with lowering of the lake.—Copyright 1973, Biological Abstracts, Inc.
W74-04203

ON THE BREAKING OF WAVES ARRIVING AT AN ANGLE TO THE SHORE,
National Engineering Science Co., Pasadena, Calif.

B. LeMehaut, and R. C. Y. Koh.
Available from NTIS as AD-632 851 for \$6.00 paper copy, \$1.45 microfiche. NESCO Report SN-134-10, February 1966. 91 p, 9 fig, 3 tab, 14 ref, 2 append. Nonr-4177(00).

Descriptors: *Waves(Water), *Shallow water, *Energy conservation, Shores, *Beaches.
Identifiers: Irrational gravity wave theory, Breakers.

By using the method of conservation of energy flux between wave orthogonals, the breaking wave characteristics are obtained for waves traveling obliquely to the bottom contours of a straight shoreline. The results of the calculations are presented in the form of nomographs by using the linear and third order irrational gravity wave theories. Three different breaking criteria are used in these calculations. In particular, a new breaking criterion is proposed for waves breaking on a gentle slope. Some calculations are also performed at the fifth order of approximation and the results compared with the linear and third order cases. (See also W74-04215 and W74-04216) (Sinha-OEIS)
W74-04217

THE OXYGEN CONSUMPTION OF CHIRONomid LARVAE FROM LOCH LEVEN IN RELATION TO TEMPERATURE,
Stirling Univ. (Scotland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-04226

EXCHANGEABLE CATIONS IN SOILS OF THE DNEIPEER RESERVOIRS,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
L. K. Palamarchuk.
Hydrobiological Journal, Vol 8, No 5, p 58-61, 1972. 1 fig, 1 tab, 13 ref. (Originally published in Gidrobiologicheskij Zhurnal, Vol 8, No 5, 1972).
Descriptors: *Reservoirs, *Lake sediments, *Cations, *Cation exchange, *Cation adsorption, Inorganic compounds.
Identifiers: *USSR(Dnieper River), Oozes.

Total exchangeable cations in sediment of Dnieper River reservoirs vary widely, between 6 and 60 meq/100 g of soil. The finer the sediment grain, the greater its exchange capacity. Bivalent cations of calcium and magnesium are predominant in the adsorbing complex of sediments, comprising about 95% of the total ions. The Ca:Mg ratio is much larger in sediments than in Dnieper water or catchment basin soils and ranges from 5-10 in the Kiev Reservoir to 6-14 in other Dnieper reservoirs. Univalent cations of exchangeable potassium, sodium, and ammonium ions are of secondary importance. Exchangeable hydrogen is a relict of terrogenous soil particles and is gradually being replaced by calcium, thereby improving the soil as a habitat for benthic organisms. Composition of exchangeable cations Ca, Mg, K, Na, NH₄, and H in oozes of the Kiev, Kremenchug, and Kakhovka Reservoirs in 1968 is tabulated. (Josefson-USGS)
W74-04255

CORRELATION OF ORGANIC CARBON WITH DIFFERENT KINDS OF OXIDIZABILITY IN THE OPEN WATERS OF LAKE BAIKAL,
Limnologicheskii Institut, Irkutsk (USSR).
Ye. N. Tarasova.

Hydrobiological Journal, Vol 8, No 5, p 53-57, 1972. 2 fig, 11 ref. (Originally published in Gidrobiologicheskij Zhurnal, Vol 8, No 5, 1972).

Descriptors: *Lakes, *Hydrobiology, *Water chemistry, *Organic matter, *Oxidation, Plankton, Biomass, Seasonal, Correlation analysis.
Identifiers: *USSR(Lake Baikal), *Organic carbon.

Organic matter was determined in the southern part of Lake Baikal between July 1967 and July 1969. Organic matter in the surface layer varied between 1.06 mg/liter (July 18, 1969) and 1.50 mg/liter (May 31, 1969), averaging 1.27 mg/liter from March 1968 to December 1968. The content of organic matter decreased slightly with depth. On the basis of averaged quantities for 1968, organic carbon in the 1,300-m layer constituted 82% of the total amount on the surface. Seasonal changes in organic carbon, permanganate oxidizability, and bichromate oxidizability in open waters of Lake Baikal are diagrammed. (Josefson-USGS)
W74-04256

SOME ASPECTS OF THE CA AND SR WEATHERING CYCLE IN THE LAKE KINNERET (LAKE TIBERIAS) DRAINAGE BASIN,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2J.
W74-04269

TYPE OF SPAWNING GROUNDS AND ECOLOGY OF SPAWNING FOR STINT, OSMERUS EPERLANUS (L.), IN THE RYBINSK RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
M. N. Ivanova, and S. N. Polovkova.
Vopr Ikhniol. Vol 12, No 4, p 684-692. 1972. Illus.
Identifiers: Ecology, Osmerus-Eperlanus, Reservoirs, *Spawning, *Stint, *USSR(Rybinsk reservoir).

Both 'lake' and 'river' spawning grounds were found in the Rybinsk Reservoir (USSR). They differed by hydrological conditions, time of the spawning period and the age-size composition of the spawners. Fish which had just matured spawned mainly at lake-grounds, while most veteran spawners used the river grounds. Different types of spawning grounds did not indicate 2 types of fish. The division into age groups increased the effectiveness of reproduction for the whole population.—Copyright 1973, Biological Abstracts, Inc.
W74-04277

ORGANIC MATTER OF THE SOIL IN THE KIEV RESERVOIR AND ITS ROLE IN THE DEVELOPMENT OF BENTHIC ALGAE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W74-04281

ALGAE FROM SOME LAKES IN NORDMARKA NEAR OSLO,
Norsk Institutt for Vannforskning, Blindern.
P. Brettm.
Blyttia. Vol 30, No 4, p 187-197. 1972. (English summary).
Identifiers: *Algae, Lakes, *Norway(Nordmarka), *Physicochemical studies.

Net samples of algae were collected from various lakes in the catchment area in the Oslo water reservoir (Norway). Physical and chemical data are given.—Copyright 1973, Biological Abstracts, Inc.
W74-04289

HYDROBIOLOGICAL STUDIES OF 2 SHALLOW PONDS: OBSERVATIONS ON TEMPERATURE AND PLANKTON DISTRIBUTION AND THE INFLUENCE OF A PLANT COVER CONTAINING LEMNA MINOR, (IN FRENCH),
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Laboratoire de Génétique Evolutive et de Biostatistique.
R. Pourriot.

WATER CYCLE—Field 2

Water In Plants—Group 2I

Ann Hydrobiol. Vol 3, No 1, p 33-46. 1972. Illus. (English summary).

Identifiers: Circadian, *Hydrobiological studies, *Lenna-minor, *Phytoplankton distribution, *Plant cover, *Ponds, Rhythm, Seasons, Temperature, Weather.

Seasonal variations and circadian fluctuations of temperatures were observed at different depths in 2 small shallow ponds. During sunny weather, the circadian amplitude of temperatures is over 5 degrees and the difference between surface and bottom is up to 10 degrees. The growth of a vegetal mat of *L. minor* modified the heat exchanges, lowered the temperature fluctuations and induced a rarefaction of the phytoplankton. Some observations show the heterogeneity of plankton distribution. During a circadian cycle, the period of less heterogeneity of the plankton and the temperature is probably at the beginning of the night (23 hr).--Copyright 1973, Biological Abstracts, Inc. W74-04291

INVESTIGATION OF THE MICROFLORA OF SWAMP ORE AND LAKE WATER BY THE METHOD OF ELECTRON MICROSCOPY, (IN RUSSIAN),

Akademii Nauk SSSR, Moscow. Institut Mikrobiologii.

For primary bibliographic entry see Field 5A. W74-04292

UTILIZATION OF AROMATIC COMPOUNDS BY BENTHIC MICROORGANISMS OF A EUTROPHIC LAKE,

Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.

For primary bibliographic entry see Field 5C. W74-04295

CHLOROPHYLL-A AND PHAEOPHYTIN: THEIR RELATIONSHIPS WITH THE CONCENTRATIONS OF NITROGEN AND PHOSPHORUS IN THE SESTON OF LAKE MONATE (NORTH ITALY), (IN ITALIAN),

European Atomic Energy Community, Ispra (Italy). Biology Div.

For primary bibliographic entry see Field 5C. W74-04300

II. Water In Plants

AN ECOLOGICAL DESCRIPTION OF A SEMI-ARID EAST AFRICAN ECOSYSTEM,

Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.

L. D. Harris.

Range Science Department Science Series No 11, January 1972, 80 p, 22 fig, 21 tab, 222 ref.

Identifiers: *Africa, *Semiarid climates, *Ecosystems, *Ecological distribution, Ecology, *Grasslands, *Herbivores, Climates, Soils, Biomes, Habitats, Vegetation. Identifiers: *Tanzania.

The Mkomazi ecosystem, a semi-arid area in northeastern Tanzania, typifies much of Africa's grazing land resource. The area exhibits the acute bush encroachment, limited water supply, and tsetse fly problems so common to African rangelands. This study of the ecosystem approach to ecological problems is intended as an introduction to the application of systems function to a particular environment where soils are classified as predominantly aridosols, and vegetation categorized as dry montane forest, bush and wooded grassland, seasonally inundated grassland, and bushland. A number of species of large herbivores are identified, with relatively few being found to dominate the animal community structure. Water seems to be the major constraint both directly and indirectly in this structure. Just as

there is a difference between food consumption and food utilization, so is there a difference between the quantity of precipitation and the quantity of usable water. Distribution and intensity of rainfall as well as temperature, soil runoff, permeability, and other soil parameters affecting the water retention capacity, play major roles in determining the system's characteristics. Thus greater water stress from west to east limits the herbivore component by lower primary productivity. (Payllore-Arizona) W74-03923

CALCIUM LOSS FROM PLANT ROOTS DURING OSMOTIC ADJUSTMENT,

Arizona Univ., Tucson.

J. N. E. Frota, and J. W. O'Leary. Journal of the Arizona Academy of Science, Vol 8, No 1, p 26-28, February 1973. 1 fig, 1 tab, 15 ref.

Identifiers: *Sodium chloride, *Calcium, *Root systems, *Soil-water-plant relationships, *Osmotic pressure, Absorption, Irrigation water, Water quality, Salinity, Water chemistry, Root zone, Halides, Salts, Soil chemistry, Plant physiology, *Saline water.

A change in calcium concentration in plant roots due to the osmotic pressure adjustment occurs when the plant is watered with saline water, as is often the case in arid regions. Radioactively tagged calcium ions were preloaded into the root systems of red kidney bean plants. When these plants were subjected to high sodium chloride water a Ca efflux was noted much greater than in plants used for control which were watered with pure water. A corresponding sodium uptake increase was also noted in the test plants. These findings suggest that in the presence of high external sodium chloride concentration, roots lose divalent calcium ions in exchange for univalent sodium ions. This calcium loss may explain several physiological effects that are contributory to the apparent toxicity of high sodium chloride irrigation waters in the root environment. (Muller-Arizona) W74-03924

SPONTANEOUS VEGETATION OF THE MURRAY SPRINGS AREA, SAN PEDRO VALLEY, ARIZONA,

California Univ., Los Angeles.

S. L. Woodward.

Journal of the Arizona of Science, Vol 7, No 1, p 12-16, February 1972. 3 fig, 13 ref.

Identifiers: *Desert plants, *Shrubs, Semiarid climates, Grasslands, Plant groupings, Biomes, *Arizona, Arid lands, Succession, Deserts, *Vegetation establishment, Riparian plants, Mesquite, Southwest U.S., *Brush. Identifiers: San Pedro Valley (Ariz), *Chihuahuan Desert, *Thornscrub.

The lower, calcareous bajadas of the upper San Pedro Valley, Arizona, are characterized by dense thornscrub with species representative of the Chihuahuan Desert. Grasses occur only on the floodplains and on small interfluvial depressions. The situation that the desertscrub formation is edaphically controlled and does not represent a recent invasion of grassland similar to that which has been found at higher elevations in Coconino County is suggested by the striking similarity of ecological conditions with those of the Chihuahuan Desert proper, as well as the absence of relict *Bouteloua* communities typical of desert grasslands. Such thornscrub has been noted as early as 1879, some twenty years before arroyo-cutting began in the area. (Muller-Arizona) W74-03927

SPECIES COMPOSITION OF FISHES IN THE SANZAR RIVER, (IN RUSSIAN),

N. Raimdzhanov.

Uzb Biol Zh. Vol 16, No 2, p 39-42, 1972.

Identifiers: Composition, *Fish species, Rivers, *USSR(Sanzar River).

Natural borders of this water system are the Turkestan and Mal'guzar mountain ridges, USSR. In contrast to up to 53 spp. of fishes in neighboring river basins, in the Sanzar river in 1968-1971 13 spp. were recorded. Of these the following 9 spp. are aborigines: *Ctenopharyngodon idella* (Valenciennes), *Gobio gobio* *lepidolaemus* (Kessler), *Varicorhinus capoataherotensis* *steinachneri* (Kessler), *Schizothorax intermedius* McClelland, *Alburnoides lipunetus* eichwaldi (Filippi), *Alburnoides taeniatus* (Kessler), *Hypophthalmichthys molitrix* (Valenciennes), *Nemachilus stoliczkoii* (Steindachner), and *Nemachilus malapterurus longicauda* (Kessler). The following 4 spp. have been introduced: *Carassius auratus gibelio* (Bloch), *Cyprinus carpio* Linnaeus, *Gambusia affinis holbrookii* (Gir.), and *Ophiocephalus argus*.--Copyright 1973, Biological Abstracts, Inc. W74-03945

DATA ON THE BIOLOGY OF ALBURNUS FILIPPII KESSLER LIVING IN THE WATER RESERVES OF THE ARMENIAN SSR, (IN RUSSIAN),

M. G. Dadikyan.

Biol Zh Arm. Vol 25, No 12, p 68-73. 1972.

Identifiers: *Alburnus-filippii, Biology, Fertility, Maturity, *Morphology, *USSR(Armenia). Water reserves.

The biology of *Alburnus filippii* Kessler found in the Armenian SSR was studied. Morphometric data, fertility and coefficient of maturity of the *A. filippii* are included.--Copyright 1973, Biological Abstracts, Inc. W74-03953

THE ROTIFERS OF THE SUBMERGED MOSESSES AND OTHER BIOTOPES IN THE DAMMED REGIONS OF THE DANUBE AT THE GERMAN-AUSTRIAN FRONTIER, (IN GERMAN),

P. J. Donner.

Arch Hydrobiol Suppl Vol 44, No 1, p 49-114. 1972. Illus. (English summary).

Identifiers: Biotopes, *Danube River, *Mosses(Submerged), *Rotifers.

Rotifers were collected from 38 stations on the shores of dammed and of flowing stretches of the River Danube. The submerged mosses, the detritus, the accumulations of rubbish, the debris, and the drying marginal region were investigated.--Copyright 1973, Biological Abstracts, Inc. W74-04001

A STUDY OF A GENERALIZED MATHEMATICAL MODEL 'PREDATOR-SACRIFICE,' (IN RUSSIAN),

Akademii Nauk SSSR, Moscow. Institut Radiotekhniki i Elektroniki.

V. F. Krapivin.

Ekologiya. Vol 3, No 3, p 28-37. 1972. Illus.

Identifiers: *Mathematical models, *Predator-sacrifice model, Ecology, Ecosystem competition, Survival.

A mathematical model of an ecological system with 3 trophic levels, based upon the Ivlev theory of competition is presented. Survival in the system is studied with respect to the character of bonds between species participating within the potential rotation. The interrelationship of the time of survival in the ecological system to the frequency of encounters of the competing populations was determined.--Copyright 1973, Biological Abstracts, Inc. W74-04092

Field 2—WATER CYCLE

Group 2I—Water In Plants

FECUNDITY OF THE GRASS CARP CTEНОPHARYNGODON IDELLA (VAL.) IN THE AMUR BASIN (IN RUSSIAN), Tikhookeanskii Nauchno-Issledovatel'skii Institut Rybnogo Khozyaistva i Okeanografii, Khabarovsk (USSR).

E. I. Gorbach.

Vop Ikhiiol, Vol 12, No 4, p 674-683, 1972, Illus. Identifiers: Age, Ctenopharyngodon-idella, Fats, *Fecundity, Food, *Grass carp, Length, Population, Spawning, *USSR(Amur River basin), Weight.

Changes in absolute and relative fecundity, length, weight, age, fat content and food supply were analyzed in grass carp from the Middle Amur River (USSR) from 1963-1968. The lowest value for absolute fecundity was observed in an 8 yr old female 67.5 cm long, the highest in a 16 yr old female 96 cm long. The number of eggs depended most on weight, less on length and least on age. With rare exceptions absolute fecundity increased as the length and weight of the female increased within a single age group. The decrease in population fecundity in 1969 was related to the decreased spawning population as a result of fishing, a decrease in the number of older fish and some decrease in the absolute fecundity as a result of unfavorable spawning conditions in 1968.--Copyright 1973, Biological Abstracts, Inc.

W74-04121

BIOECOLOGICAL OBSERVATIONS ON GAM-BUSIA AFFINIS HOLBROOKI GIRARD LIVING IN SULFUROUS, WARM AND BRACKISH WATERS (IN ITALIAN), E. Gelosi.

Boll Pesca Piscic Idrobiol, Vol 25, No 2, p 345-348, 1970, Illus. English summary.

Identifiers: Brackish water, *Ecological studies, *Gambusia-affinis-holbrooki, *Sulfurous water, Salinity, Water temperature.

Some observations are given of a population of *G. affinis holbrooki* living near a sulfurous spring with temperature from 25 deg-30 deg C and 13% salinity.--Copyright 1973, Biological Abstracts, Inc.

W74-04122

SIMULATION OF THE ENERGY BALANCE OF A GREENHOUSE, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

B. A. Kimball.

Agricultural Meteorology, Vol 11, 1973, p 243-260, 6 fig, 1 tab, 25 ref.

Descriptors: *Model studies, *Solar radiation, *Greenhouses, *Energy budget, Latent heat, Radiation, Microenvironment, Vapor pressure, Environmental control, Air temperature, Soil temperature.

The large amount of sunshine which occurs in arid areas lends itself to greenhouse agriculture. In this investigation, the energy balance of a greenhouse was modeled on a digital computer. Thermal radiative, sensible, latent, and conductive heat were simulated by mathematical expressions dependent on unknown temperatures and vapor pressures. Sun angle elevation and the optical properties of the greenhouse were used to calculate solar radiation. Equations for the energy balance of the system were developed at various points in the greenhouse and were summed to zero. Radiation fluxes and temperature measurements were acquired in a sample greenhouse to provide real data with which to compare values to the simulation. The observed and predicted values agree closely for various environmental conditions imposed upon the greenhouse system. It is concluded that the model can accurately predict the heating and cooling requirements of a greenhouse for evaluation of water use in such a system. (Muller-Arizona)

W74-04126

DROUGHT-AFFECTED MITOCHONDRIAL PROCESSES AS RELATED TO TISSUE AND WHOLE PLANT RESPONSES, Illinois Univ., Urbana. Dept. of Agronomy. For primary bibliographic entry see Field 3F.

W74-04127

FIRE CLIMATES IN THE SOUTHWEST, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 4A.

W74-04130

LEAF ORIENTATION OF A COTTON PLANT, Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.

For primary bibliographic entry see Field 3F.

W74-04132

ABSCISSION PROCESSES IN COTTON: INDUCTION BY PLANT WATER DEFICIT, Texas A and M Univ., College Station. Dept. of Plant Sciences.

For primary bibliographic entry see Field 3F.

W74-04136

CHANGES IN VESSEL DIAMETER IN TWO SPECIES OF HERBACEOUS PLANTS, (IN RUSSIAN), L. I. Lipaeva.

Bull Mosk O-Va Ispyt Prir Otd Biol. Vol 77, No 3, p 133-137. 1972. (English summary).

Identifiers: *Hemp, *Herbaceous plants, *Nettle, *Plants(Vessel constriction), Species, Stomata, Transpiration.

Female plants of nettle and hemp had a higher number of stomata and transpired more intensely than male plants. Their vessels also constricted more. Plants grown in sun had a higher number of stomata and greater vessel constriction than those grown in the shade. Leaves located at upper nodes also had a higher number of stomata and longer veins than lower leaves.--Copyright 1973, Biological Abstracts, Inc.

W74-04280

STRUCTURE AND PRODUCTIVITY OF THE PHYTOMASS OF GIGANTIC BUNCH-FORMING GRASSES IN THE AMU DARYA FLOODPLAIN, (IN RUSSIAN), Akademiya Nauk Turkmensoi SSR, Ashkhabad. Instit Botaniki.

A. I. Gladyshev, and I. F. Kazakov.

Izv Akad Nauk Turkmen SSR Ser Biol Nauk. 3, p 33-39. 1972. Illus.

Identifiers: *Erianthus-Ravennae*, *Floodplains, *Glycyrrhiza-Glabra*, *Grasses(Bunch-forming), Phytomass, *Productivity, *Saccharum-Spontaneum*, *Typha-Minima*, *USSR(Amu-Darya floodplain), Organic matter.

The below-and-above-ground mass of the bunch-forming grass formations along the middle course of the Amu Darya (USSR), their productivity, growth dynamics and litter fall were determined. *Synusia* of *Saccharum spontaneum*, *Erianthus ravennae*, *Typha minima* and *Glycyrrhiza glabra* from association of *S. spontaneum*, *S. spontaneum-T. minima* and *E. ravennae-G. glabra* were analyzed. *S. spontaneum* and *E. ravennae* produced great amounts of organic mass (40-60 T/ha of absolute dry matter).--Copyright 1973, Biological Abstracts, Inc.

W74-04282

ARCHITECTURE OF RIPARIAN FOREST VEGETATION OF RIVERS AND CREEKS OF FRENCH GUIANA,

Office de la Recherche Scientifique et Technique Outre-Mer, Cayenne (French Guiana). Centre ORSTOM de Cayenne.

A. A. Oldemann.

Adansonia. Vol 12, No 2, p 253-265. 1972. Illus.

Identifiers: Creeks, Erosion, *Forests, *French Guiana, Light availability, *Riparian plants, River, Rivers, Seasonality, *Vegetation.

At first sight, riparian forest vegetation in French Guiana shows a gradual change of mean growth direction from vertical to horizontal at the riverside and a proliferation of vertical offshoots. A more detailed investigation of some ecologically important trees reveals the existence of riparian behavior under the joint ecological gradients of light availability, plant crowding, seasonal decrease of soil cohesion and moderate erosion of meandering rivers, all 'pushing away' from the forest. Besides the change in mean growth direction and numerous offshoots, the vegetation is also distinguished by asymmetric crown development and dense stratification of plagiotrophic branches. These architectural features of riparian forest vegetation do not explain differences existing between its floristic composition and that of the adjacent rain forest, and suggest that its study may yield valuable information about the forest canopy.--Copyright 1973, Biological Abstracts, Inc.

W74-04285

ANNUAL INCREASE OF ABOVEGROUND PHYTOMASS OF SOME TUNDRA SHRUBS, (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Geobotany.

E. B. Pospelova.

Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 3, p 50-55. 1972. (English summary).

Identifiers: Annual, *Betula-Nana*, Growth, *Phytomass, *Salix-Glauc*, *Salix-Pulchra*, *Shrubs, Snow, Soils, Temperature, *Tundra shrubs, *USSR(Western Taimyr).

The data on the annual increase of green and woody biomass of the shrub layer dominants (*Betula nana*, *Salix pulchra*, *S. glauca*) in the main tundra types of the station 'Agapa' (Western Taimyr, 71 deg 30 min N (USSR) are given. Important factors that influence growth are the depth of thawing, snow cover, and soil temperatures. The highest increase of phytomass is on defended slopes of gullies and depressions of hillocky tundras and bogs; the lowest increase is on open tops of watersheds.--Copyright 1973, Biological Abstracts, Inc.

W74-04286

THE DIATOMACEOUS POPULATIONS IN THE BASIN OF THE MEURTHE RIVER: ATTEMPT AT AN HYDROBIOLOGICAL SYNTHESIS, (IN FRENCH), Nancy Univ. (France). Laboratoire de Biologie Vegetale.

J-F. Pierre.

Ann Hydrobiol. Vol 3, No 1, p 5-19. 1972. Illus. (English summary).

Identifiers: *Diatomaceous populations, *France(Meurthe River basin), *Hydrobiological studies, Physicochemical studies, River basins, *Algae, Algae growth.

Comparison is made between the physical and chemical water characteristics of the Meurthe river (France) and those of 3 tributaries which flow on different substrata. Consequences on the distribution of the algae are studied. The algal flora of the Meurthe river is the result of a mixing between dominant algal populations which develop in situ and reduced populations proceeding from upstream.--Copyright 1973, Biological Abstracts, Inc.

W74-04288

WATER CYCLE—Field 2

Erosion and Sedimentation—Group 2J

PRELIMINARY DATA ABOUT THE SEASONAL CHANGES AND VERTICAL STRATIFICATION OF PERiphyton FROM THE MIDDLE REACH OF THE RIVER DANUBE,
Slovenske Polohospodarske Akademie,
Bratislava (Czechoslovakia). Laboratorium
Rybárska. For primary bibliographic entry see Field 5A.
W74-04294

2J. Erosion and Sedimentation

INDICATIONS OF STREAMBED DEGRADATION IN THE WILLAMETTE VALLEY,

Oregon State Univ., Corvallis. Dept. of Civil Engineering.

P. C. Klingeman.

Availability from NTIS as PB-227 248 \$4.00 in paper copy, \$1.45 in microfiche. Oregon State University, Corvallis, Water Resources Research Institute, Project completion report WRRI-21, December 1973. 99 p, 16 fig, 3 tab, 4 ref, append. OWRR A-016-ORE(1).

Descriptors: *Degradation(Stream), Scour, Sediment transport, Erosion, Bed load, *Oregon, Streambeds, Stream erosion, Gaging.

Identifiers: *Willamette River Basin(Ore).

A brief study of possible streambed elevation changes in the Willamette Basin was made to develop techniques for such analysis and to make a preliminary assessment of the extent of any indicated problems of streambed degradation and their likely causes. Records from 11 gaging stations were subject to a 'specific gage' analysis to detect changes in rating curve characteristics. Supplemental information from flood records, aerial photographs, maps, and other sources was then used to attempt an explanation for any indicated changes in the specific gage curves at each station. Several characteristics which might be shown by specific gage curves were developed from general considerations and compared with the curves at the given sites in order to interpret changes. The main-stem Willamette River and nearby portions of some tributaries are subject to water stage lowering, although other streams in the basin are not. Streambed degradation along the main-stem Willamette is approximately 1 foot per decade and may be due to several factors, such as natural geological events, sand and gravel removal, bank stabilization, and watershed changes. However, upstream dams do not appear to have had much effect to date on changes in specific gage for the main-stem.

W74-03770

WATER-SEDIMENT SPLITTER FOR RUNOFF SAMPLES CONTAINING COARSE-GRAINED SEDIMENT,

Agricultural Research Service, Watkinsville, Ga. W. G. Fleming, and R. A. Leonard. Soil Science Society of America Proceedings, Vol 37, No 6, p 961-962, November-December 1973. 2 fig, 1 tab.

Descriptors: *Sampling, *Instrumentation, *Sedimentology, Suspended load, Sediment yield, Soil erosion, Runoff.

Identifiers: *Sample splitters.

A water-sediment sample splitter was designed for dividing samples up to 20 liters into three equal and representative smaller samples for chemical and physical analyses. This funnel-shaped device with a mechanical agitator divides samples containing particles up to 2 mm without first separating the sediment from the water. The splitter divides samples containing coarse sediments into three parts with a distribution of 33% + 2% in each. The device has application in assuring representative samples of runoff from watershed or similar runoff studies. (Knapp-USGS)

W74-03780

WIND EROSION AS A FACTOR IN SOIL FORMATION IN THE PIERRE-SHALE LANDSCAPE OF WESTERN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Soil Science.
E. M. White. Soil Science Society of America Proceedings, Vol 37, No 6, p 919-923, November-December 1973. 3 fig, 29 ref.

Descriptors: *Soil formation, *Wind erosion, *South Dakota, *Aeolian soils, Blowouts, Shales, Clays, Geomorphology.

Slopes exposed to the prevailing NW-SE winds in the Pierre-shale landscape of western South Dakota have been eroded at a slow rate when vegetation was either destroyed by fire or weakened by drought since at least the Pleistocene. Slopes protected from the prevailing winds have had negligible wind erosion except in areas where severe erosion created deflation basins. These blowout basins are limited to small interfluvial areas, a few square miles in size, which probably had a thick layer of loose, sand-size fissile-shale fragments that winds could erode. Soils in areas with blowout basins usually are more weakly developed, have shale at shallower depth, have little or no gigai development, and appear to be younger than soils in comparable areas without deflation basins. Thus, the soil age in these areas is less than would be predicted from the geomorphic relationships to Pleistocene terrace systems. Soils in one area with deflation basins have development comparable to soils derived from late-Wisconsin drift. (Knapp-USGS)

W74-03781

RIVER RESPONSE,
Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 2E.
W74-03785

FLOW OVER ALLUVIAL BED,
Colorado State Univ., Fort Collins. Engineering Research Center. For primary bibliographic entry see Field 2E.
W74-03786

THE RHEIN STUDY,
California Univ., Berkeley.
H. A. Einstein.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 4, p 4-1-4-18, 1973. 6 fig, 11 ref.

Descriptors: Descriptors, *Sediment transport, *Bed load, *Hydraulic models, Gravels, Hydraulic similitude, Sedimentology, Model studies, Sampling, Shear stress, Alluvial channels.

Identifiers: *Rhine River.

The general study of the transport of sediment by the Rhine River is reviewed. A flume with a 2.0 x 2.0 m cross section and a 50 m usable channel length (which was much later extended to twice that length) was used to model the river. The reach of the river studied is a mountain stream with a gravel bed of 28 mm average grain size. The channel is improved but was at the time of the study steadily aggrading. A set of flume experiments in two scales, one close to prototype scale, the other about 5 times smaller (in linear scale) led to the Meyer-Peter formula for bedload transport. This formula satisfied the Froude similarity between different sizes of sediment. Systematic river measurements of the geometry, the flow conditions and of the sediment transport were carefully coordinated with the studies in the laboratory. The grain-size composition of the bedload transport appears to be almost identical to that of the large gravel bars. The model study of the river channel led to the establishment of similarity rules for the transport of bed material. For the calculation of

the bedload transport in a channel with strongly developed alternate bars of considerable height the assumption of an evenly distributed shear stress over the bed is insufficient; the variation of the shear stress must be introduced, for instance, as a variation of the water depth. (Knapp-USGS)

W74-03788

REGIME PROBLEMS OF RIVERS FORMED IN SEDIMENT,
Alberta Univ., Edmonton. T. Blech.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 5, p 5-1-5-33, 1973. 9 fig, 32 ref.

Descriptors: *Alluvial channels, *Channel morphology, *Sediment transport, Sedimentation, Regime, Profiles, Hydraulics, Open channel flow, Sedimentology, Bed load, Suspended load, Sedimentary structures.

Quantitative relations may be calculated in rivers, canals, and laboratory flumes where, starting from an imagined arbitrary state, the imposition of an average steady flow of water and sediment has resulted in the development of an average steady channel whose boundary has formed itself, at least partially, from the sediment in the flow. Graphs and formulas obtained from observations provide a means for estimating quantitatively the changes that will develop in the breadth, depth, slope, and meander sizes of rivers after human interference with their regimes. (Knapp-USGS)

W74-03789

DISPERSION OF CONTAMINANTS ATTACHED TO SEDIMENT BED LOAD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B.
W74-03797

BEHAVIOR OF COHESIVE MATERIAL FROM A SOIL ENGINEER'S VIEWPOINT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

F. D. Nielsen. In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 14, p 14-1-14-28, 1973. 22 fig, 1 tab, 16 ref.

Descriptors: *Soil erosion, *Cohesive soils, *Erosion, *Clay minerals, Water chemistry, Pore water, Cohesion, Ion exchange, Soil physical properties, Soil chemical properties.

The erosive characteristics of cohesive soils are controlled by electrical surface phenomena while granular soil is controlled by gravity forces. Electrical surface charge on the clay particle has a major effect on the performance of the cohesive soil mass. Cations in the pore fluid also have a significant effect on the erosive characteristic of the soil. In general, the nature of erosion resistance in cohesive soil is much more complex than in granular soils. These variables must be included in any research on cohesive soil: soil type, soil fabric, cation exchange capacity, cation type and concentration in the pore fluid and as exchangeable cations, temperature, pH, water content of the soil, organic matter in the soil, soil density (void ratio), shear strength, atterberg limits, and particle size. (Knapp-USGS)

W74-03798

UPSLOPE EROSION ANALYSIS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
W. H. Wischmeier.

Field 2—WATER CYCLE

Group 2J—Erosion and Sedimentation

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 15, p 15-15-26, 1973. 6 fig, 3 tab, 26 ref.

Descriptors: *Erosion, *Soil erosion, Equations, *Sediment yield, Slopes, Rainfall-runoff relationships, Impact(Rainfall), Vegetation effects, Land management.

Identifiers: *Universal Soil-Loss equation.

The rate of erosion on a particular land area is determined by complex interrelations of many factors. These include factors that influence the erosive forces of rainfall and runoff and others that influence the resistance of the soil to detachment or transport by the erosive agents. The universal soil loss equation is a less refined but highly useful erosion model that was empirically derived from the upslope erosion data of the past 40 years. The equation computes sheet and rill erosion as a function of rainfall erosivity, soil erodibility, length and percent of slope, cropping and management, and supplemental conservation practices. For predictions of long-term average soil losses from specific upslope areas, its accuracy within the 37 states appears to be well within the needs for erosion control planning. Its application is limited to states and countries where information is available for local evaluations of the equation's individual factors. A relatively small amount of well designed local research should enable many countries to adapt the soil loss equation and basic relationships to their situations. (Knapp-USGS)

W74-03799

SUSPENDED-SEDIMENT SAMPLING VARIABILITY,

Geological Survey, Fort Collins, Colo.

J. P. Bennett, and C. F. Nordin.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 17, p 17-17-22, 1973. 9 fig, 1 tab, 9 ref.

Descriptors: *Suspended load, *Sampling, Variability, Statistics, Statistical methods, Channel morphology, Equations, *Sediment transport, Convection, Open channel flow.

A knowledge of the possible variations to be encountered in sampling is necessary for interpretation of any suspended sediment data. For most cases of practical interest, the standard deviation of the depth-integrated average concentration of suspended load in a particular vertical will not often be larger than 10% of the mean concentration in the vertical. This means that any properly collected depth-integrated sample in a particular vertical probably will represent the mean suspended load through that vertical. The variation between various verticals in a cross section may be much larger than 100%, requiring that a number of verticals be sampled to obtain a good estimate of the total suspended load transported through a particular cross section. From 7 to 9 cross sections may have to be sampled to obtain a stable estimate of the total material being transported by a shallow sand-channel stream. (Knapp-USGS)

W74-03801

DISTRIBUTION OF ZR, TI, NI, CO, PB, CU, AND OTHER ELEMENTS IN THE SURFACE LAYER OF RECENT SEDIMENTS OF LAKE BALKHASH (RASPREDENIYE ZR, TI, NI, CO, PB, CU I DRUZHKE ELEMENTOV V POVERKHNOSTM SLOYE SOVREMENNYYKH OSADKOV OZ. BALKHASH),

Adademiya Nauk SSSR, Moscow. Geologicheskii Institut.

For primary bibliographic entry see Field 2H.

W74-03827

BASIC TYPES OF RECENT BOTTOM SEDIMENTS OF THE MEDITERRANEAN SEA, THEIR MINERALOGY AND GEOCHEMISTRY (OSNOVNYYE TIPY SOVREMENNYKH DONNYKH OSADKOV SREDIZEMNOGO MORYA, IKH MINERALOGIYA I GEOKHIMIYA),

Adademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.

Ye. M. Yemel'yanov.

Litologiya i Poleznye Iskopayemye, No 1, p 29-46, January-February 1973. 4 fig, 3 tab, 31 ref.

Descriptors: *Bottom sediments, *Recent epoch, *Sedimentology, *Mineralogy, *Geochemistry, Sands, Silts, Clay minerals, Detritus, Inorganic compounds, Metals, Trace elements, Volcanoes, Maps.

Identifiers: USSR, *Mediterranean Sea, Oozes.

The composition and distribution of bottom sediments in the Mediterranean Sea are highly complex. The formation of individual sediment types is affected by factors which are clearly reflected in the granulometric, mineralogical, and chemical compositions of the deposits and in their physical properties. Terrigenous sediments occur in geosynclinal regions, around the mouth of the Nile River, and in the vicinity of Cyprus and Syria. Volcanoclastic deposits occur in the lagoon formed by the Santorin Volcano, in the Bay of Naples, and in the underwater part of the Stromboli volcanic cone. Volcanogenic iron-ore deposits have been found in the Santorin lagoon. Biogenic calcareous sediments are widespread in the Aegean Sea and Sea of Crete and in the arid zone of the eastern Mediterranean. Chemogenic oolithic sediments occur on the Egyptian and Tunisian shelf and manganese-bearing sands, on the peak of a submarine volcanic mountain in the Tyrrhenian Sea. Despite the presence of many active volcanoes, the volcanic factor plays a minor role in sedimentation. In distribution of sediment types and their composition, the Mediterranean Sea is a transitional basin between marine bodies of water and the ocean. Data are presented on mineralogy of sandy and silty fractions, absolute age of terrigenous-volcanogenic minerals and on distribution of CaCO₃, MgCO₃, amorphous SiO₂, organic C, Fe, Mn, Ti, P, Au, B, Ni, Co, Cr, U, Cu, Mo, Sr, and Ba in sediments. (Josefson-USGS)

W74-03828

RECENT SEDIMENTS OF THE PACIFIC OCEAN OFF THE COASTS OF PERU AND CHILE (SOVREMENNYYE OSADKI TIKHOGO OKEANA U BEREZOV PERU I CHILI),

Leningrad State Univ. (USSR).

N. V. Logvinenko, and Ye. A. Romankevich.

Litologiya i Poleznye Iskopayemye, No 1, p 3-16, January-February 1973. 4 fig, 2 tab, 12 ref.

Descriptors: *Sediments, *Bottom sediments, *Pacific Ocean, *Recent epoch, Sands, Silts, Clays, Clay minerals, Mineralogy, Detritus, Sediment distribution, Continental shelf, Continental slope, Coast, Maps.

Identifiers: USSR, *Peru, *Chile, Oozes.

General characteristics of recent sediments in the southeastern part of the Pacific Ocean and conditions of their formation are described. Recent sediments over the entire area of the ocean bottom are characterized by the constant presence of organogenic components: diatomaceous algae, radiolarians, sponge spicules, teeth and bones of vertebrates, foraminifera, and spores and pollens of land plants. Only mollusk shells are localized in the narrow area of the shallow-water shelf. Special attention is given to clastic components, sources of supply of clastic material, and its distribution in sediments. Three terrigenous-mineralogical provinces were identified: (1) the northern nearshore province located between the equator and approximately 8-10 deg South Latitude where quartz predominates over feldspars; (2) the southern nearshore province located between 8-10

and 30-32 deg South Latitude where feldspars predominate over quartz and kaolinite appears at its southern boundary; and (3) the ocean floor province located west of the deep-sea basin in the area of development of pelagic foraminiferal oozes and red deep-sea clay, where the influence of land is weaker and where volcanic material and various authigenic minerals occur in large amounts. Types of sediments in the southeastern part of the Pacific Ocean are tabulated. (Josefson-USGS)

W74-03829

A RECONNAISSANCE OF STREAMFLOW AND FLUVIAL SEDIMENT TRANSPORT, INCLINE VILLAGE AREA, LAKE TAHOE, NEVADA, SECOND PROGRESS REPORT 1971, Geological Survey, Carson City, Nev.

P. A. Glancy.

Nevada Division of Water Resources, Carson City, Water Resources-Information Series Report 19, 1973. 37 p, 1 fig, 7 tab, 6 ref, append.

Descriptors: *Sediment transport, *Streamflow, *Lakes, *Nevada, Hydrologic data, Data collections, Sediment yield, Sediment load, Fluvial sediments, Particle size, Nutrients, Water quality, Flow rates, Rainfall, Snowmelt, Correlation analysis.

Identifiers: *Lake Tahoe(Nev), Incline Village area(Nev).

Runoff of the five major streams in the Incline Village area, Nevada, was about 17,600 acre-feet during the 1971 water year. About three-fourths of the runoff was from Incline and Third Creeks. Sediment transported to Lake Tahoe by the major streams was estimated to be about 11,000 tons, of which about 60% was from Incline and Third Creeks. About 90% of the sediment was delivered to the lake during the snowmelt runoff period. The annual sediment load was estimated to be about 78% sand and gravel, 13% silt, and 9% clay. Sediment transported by streams during periods of rainfall runoff generally contained greater percentages of silt and clay than that transported by snowmelt runoff. Estimated annual sediment yields ranged from 60 to 930 tons per square mile from undeveloped areas, and 620 to 7,600 tons per square mile from developed areas. The highest measured concentrations of nitrogen transported by streams to the lake during periods of heavy sediment transport were of dissolved ammonia and occurred during periods dominated by low-alitude runoff. (Woodard-USGS)

W74-04050

GELATIN COATED MICROSCOPE SLIDES IN SEDIMENTARY SIZE ANALYSIS,

Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.

L. A. Perrie, and P. A. Peach.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1174-1175, December 1973.

Descriptors: *Particle size, *Microscopy, *Laboratory tests, *Analytical techniques, *Sedimentology, Sediments.

Identifiers: Microscope slides.

The use of gelatin-coated microscope slides for the support of clay sized particles prevents movement in the mounting medium leading to flocculation or clumping, which may affect the accuracy of particle size analysis with an image analyzing computer. Because of the hydroscopic properties of gelatin, the water is quickly absorbed leaving the grains stuck to the surface to which they become cemented, dispersed and almost immediately immobile. The method of dispersing the grains and applying them to the slides consists of taking about 0.10 gram of the material to be mounted, mixing it with distilled water in a microbeaker to which has been added a drop of 10% solution of sodium hexametaphosphate as a wetting agent and agitating

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the mixture with an ultrasonic probe. A sample of the dispersed suspension is drawn off with a micropipette, transferred immediately to a dry gelatin-coated slide, and spread at once over the surface of the slide with the side of the pipette. This is the simplest way to obtain reasonable consistent dispersion of such materials as the finer grades of mine mill products, and of industrial chimney smoke and fly ash particles for evaluation of size distribution. (Knapp-USGS)
W74-04055

MEASURING VOLUMES OF SEDIMENTARY GRAINS,
Puerto Rico Univ., Mayaguez. Dept. of Geology.
M. T. Moussa.
Journal of Sedimentary Petrology, Vol 43, No 4, p 1171-1173, December 1973. 3 ref.

Descriptors: *Specific gravity, *Density, *Volume, *Laboratory tests, Laboratory equipment, Analytical techniques, Instrumentation, Equipment, Sedimentology.
Identifiers: Laboratory balances.

To determine the volumes of individual sediment grains or fossils the hydrostatic weighing method based on Archimedes' principle is the simplest, and probably the most accurate method available. Any simple weighing instrument can be used without constructing special devices. The sediment grain or fossil is first used without constructing special devices. The sediment grain or fossil is first weighed in air. It is then placed on a small pan, loop, two-pronged hook or any suitable device and suspended by a very thin wire in a small container filled with distilled water (or other liquid of known density) and weighed while immersed completely in liquid. Several factors may affect the results of the hydrostatic weighing method especially if a high degree of accuracy is required. One factor is the variation of the specific gravity of any fluid with temperature; at normal atmospheric temperatures, however, the variation for water is so small that under normal laboratory conditions its effect can be safely neglected. The adherence of small air bubbles to the surface of a grain may become a serious source of error. Their prevention can be achieved by using a liquid of low surface tension (a liquid with a higher wetting power) as immersion medium or by adding a small amount of it to the water. Another source of error, especially when dealing with very small grains, is surface tension of the immersion liquid on the wire used for suspension. This effect will be negligible if air weighing is performed while the suspension device is immersed in fluid. (Knapp-USGS)
W74-04056

APPARATUS FOR STUDIES OF ARTIFICIAL SEDIMENTS,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Baas-Becking Geobiological Lab.
B. Bubela, and J. Ferguson.
Journal of Sedimentary Petrology, Vol 43, No 4, p 1167-1170, December 1973. 3 fig.

Descriptors: *Sedimentology, *Model studies, *Sampling, Oxidation-reduction potential, Hydrogen ion concentration, Hydrogen sulfide, Oxygen, Core drilling.

An apparatus for studies of artificial sediments is equipped with a coring rig that includes a novel design of self closing valve for vertical coring of unconsolidated sediments, and a device for horizontal sampling for microanalysis. Eh, pH, H₂S, and O₂ are measured by microelectrodes inserted directly into the microsampler. The apparatus, originally designed to study a simulated sedimentary system, can be used for a variety of sedimentological studies. (Knapp-USGS)
W74-04057

LOGNORMAL SIZE DISTRIBUTION OF PARTICULATE MATTER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Mahmood.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1161-1166, December 1973. 4 fig, 8 ref.

Descriptors: *Particle size, *Distribution patterns, *Statistical methods, *Probability, Statistics, *Sedimentology, Simulation analysis, Sediment transport.
Identifiers: Lognormal distributions.

Communication, analysis and interpretation of size distribution data for particulate matter are greatly simplified if observed size distributions can be represented by known probability density functions. Lognormal size distribution is often found applicable to particulate matter in nature and in industrial processes. In practice, many advantages accrue when lognormal distribution is applicable. Processes involving 'proportionate effect' yield lognormal size distributions. Numerical experiments show that alluvial transport of sand-size bed material also results in lognormal size distribution even though the starting bed material has a uniform or gaussian distribution. (Knapp-USGS)
W74-04058

DETERMINATION OF ORGANIC CARBON IN MODERN CARBONATE SEDIMENTS,
Geological Survey, Denver, Colo. Office of Energy Resources.

A. A. Roberts, J. G. Palacas, and I. C. Frost.
Journal of Sedimentary Petrology, Vol 43, No 4, p 1157-1159, December 1973. 2 tab, 17 ref.

Descriptors: *Organic matter, *Carbon, *Carbonates, *Chemical analysis, *Analytical techniques, Carbonate rocks, Bottom sediments.
Identifiers: Organic carbon.

In the routine analysis for organic carbon in modern unconsolidated sediments the initial step commonly is to remove the carbonate carbon by acid treatment and to analyze directly the organic carbon in the residue. As much as 44% of the organic carbon is modern carbonate sediments from Florida Bay, Florida, is solubilized and lost during the acid treatment. Therefore, the amount of carbon in the acid solution in these, and in similar modern sediments, must also be included in the analysis for an accurate determination of the percentage of total organic carbon in the sample. (Knapp-USGS)
W74-04059

ENVIRONMENTAL DETERMINATION USING HYDRAULIC EQUIVALENCE STUDIES,
Susquehanna Univ., Selinsgrove, Pa. Dept. of Geological Sciences.

R. H. Lowright.
Journal of Sedimentary Petrology, Vol 43, No 4, p 1143-1147, December 1973. 4 fig, 10 ref.

Descriptors: *Beaches, *Dunes, *Suspended load, *Bed load, *Sampling, Particle size, Hydraulic similitude, *Settling velocity, Sedimentary structures, Stratigraphy, Sedimentology.
Identifiers: *Hydraulic equivalence.

It is possible to distinguish between beach and dune deposits and to differentiate between suspension and traction load deposits in streams on the basis of light and heavy mineral settling velocity distributions. Settling velocity distributions in beaches and dunes were compared with those for sands from the shallow nearshore zone. Data from shallow nearshore samples overlap that from samples from all the other environments. Therefore, environmental discrimination on the basis of a single sample is not possible using this method. However, if several samples collected from the same stratigraphic unit throughout a large area were analyzed, it should be possible to determine the

environment of deposition of the sands. (Knapp-USGS)
W74-04060

INTERNAL GEOMETRY AND ORIGIN OF VEGETATED COASTAL SAND DUNES,
Virginia Inst. of Marine Science, Gloucester Point, V. Goldsmith.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1128-1142, December 1973. 15 fig, 1 tab, 20 ref. DACW Contract 82-67-C-0004.

Descriptors: *Dunes, *Sedimentary structures, *Sedimentation, *Winds, *Massachusetts, *Dune sands, Stratification, Vegetation effects, Sediment transport, Deposition (Sediments).
Identifiers: *Monomoy Island (Mass).

Frequency distributions of dip angles, azimuths, and elevations of 209 eolian cross-bed sets from Monomoy Island, Cape Cod, Massachusetts, were analyzed and compared with similar data from the coastal sand dunes of Mustang Island, Texas; Sapelo Island, Georgia; Praia de Leste, Brazil; and Israel. These analyses from five widely scattered localities show that vegetated coastal sand dunes have a distinctive internal dune geometry. At all five locations, azimuth distributions correlate with the prevailing winds, whether directly or with a bimodal azimuth distribution bisected by the prevailing wind vectors. Also, the dip distributions center at two modes, 11 deg-15 deg and 25 deg-35 deg. It is suggested that the high-angle dips form as pyramidal wind shadow dunes via slip-face accretion behind large vegetation hummocks, which results in the distinct bimodal azimuth distribution. On Monomoy, the combined azimuths show a statistically significant correlation with three prevailing northwest, southwest, and southeast wind directions rather than with the dominant northeast storm winds. This association is valid for crossbed sets at any dune elevation. The Monomoy dune geometry is closely dependent on growth of dune vegetation, especially Marram grass. The grasses act as baffles, trapping sand moved by the prevailing winds, which results in low-angle crossbed sets formed by the vertical accumulation of sand behind vegetation hummocks on the gently undulatory, nearly horizontal upper surface of the dunes. Thus, vegetation plays a distinctive role in the formation and internal geometry of vegetated coastal sand dunes. (Knapp-USGS)
W74-04061

PSEUDO-CROSSLAMINATION FORMED BY CLIMBING ADHESION RIPPLES,
Geological Survey, Corpus Christi, Tex.
R. E. Hunter.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1125-1127, December 1973. 3 fig, 9 ref.

Descriptors: *Ripple marks, *Dunes, *Sediment transport, *Saltation, Wind erosion, Deposition (Sediments), *Dune sands, Sedimentary structures.

Adhesion ripples, which are formed when saltating dry sand adheres to a wet sand surface, migrate upwind during deposition of the sand. The internal structure of climbing adhesion ripples resembles crosslamination, because stratification defining successive positions of the depositional surface is typically absent or very poorly defined. Deposits formed by these ripples are likely to be preserved, and, if well exposed, this structure may be distinguishable from crosslamination. (Knapp-USGS)
W74-04062

FLUME EXPERIMENTS ON THE TRANSITION FROM RIPPLES TO LOWER FLAT BED WITH INCREASING SAND SIZE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
J. B. Southard, and L. A. Boguchwal.

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Journal of Sedimentary Petrology, Vol 43, No 4, p 1114-1121, December 1973. 5 fig, 1 tab, 14 ref. ONR Contract N00014-67-A-0204-0048.

Descriptors: *Sediment transport, *Bed load, *Hydraulic models, Currents(Water), Regime, *Flumes, Particle size, Velocity, Ripple marks, Sand waves, Sedimentary structures.

Observations were made in a small flume with three sizes of very well sorted quartz sand at constant mean flow depth to study in detail the relationship between ripples in finer sands and the lower-flat-bed mode of transport at similar velocities in coarser sands. A graph of mean flow velocity vs. sediment size for a flow depth of 7 cm plotted from the flume runs shows that in the size interval from 0.6 mm to 0.7 mm the lower flow velocities and dunes at higher flow velocities, so that the sequence of bed configurations in these sizes is more complicated than for either finer or coarser sands. The ripple field pinches out with increasing size at about 0.7 mm. There is a triple point involving ripples, dunes, and lower flat bed at about 0.6 mm. (Knapp-USGS) W74-04063

AN OCCURRENCE OF 'BRICK PATTERN' OSCILLATORY RIPPLE MARKS AT MONO LAKE, CALIFORNIA,

Oregon State Univ., Corvallis. School of Oceanography.

P. D. Komar.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1111-1113, December 1973. 3 fig, 5 ref.

Identifiers: Mono Lake(Calif).

An occurrence of 'brick pattern' oscillatory ripple marks, with ridges spanning the ripple troughs forming a system of stripes at right angles to the ripple crests, was found at Mono Lake, California. This pattern was compared with that obtained in laboratory experiments by Bagnold (Proc. Royal Soc. London, ser A, Vol 187 p 1-15, 1946). In lake environments the ripple length is about a factor 0.8 of the near-bottom orbital motion under the waves. Using this factor, the orbital diameter must have been about 7.8 cm. Observations of waves on the lake on numerous occasions always gave wave periods close to 1.0 second. At this period the maximum near-bottom orbital velocity would have been 24.5 cm/sec, more than enough to move the sands and cause rippling. At the 28-cm depth, a wave height of 13.3 cm would have been required to yield the 7.8 cm orbital diameter for a wave period of 1.0 second. Such a wave height is quite reasonable for Mono Lake and would yield a stable wave. Brick pattern ripples occur when the orbital diameter is reduced to about one-third of the ripple length. The water vortices must break up into separate or nearly separate pieces. A bridge develops where the separate vortices join. At Mono Lake, these must have been generated as the storm subsided and the wave heights decreased to about 4 cm. (Knapp-USGS) W74-04064

THE THRESHOLD OF SEDIMENT MOVEMENT UNDER OSCILLATORY WATER WAVES,

Oregon State Univ., Corvallis. School of Oceanography.

P. D. Komar, and M. C. Miller.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1101-1110, December 1973. 7 fig, 1 tab, 13 ref. NSF Grant GA-36817.

Descriptors: *Erosion, *Bottom sediments, *Waves(Water), *Sediment transport, Current(Water), Suspended load, Bed load, Turbulent flow, Laminar flow, Unsteady flow, Surf.

As the velocity of the to-and-fro water motion near the bottom under oscillatory waves is increased, a stage is reached when the water exerts a stress on the particles sufficient to cause them to

move. For grain diameters less than about 0.05 cm (medium sands and finer) the threshold is reached while the flow in the boundary layer is still laminar. This is described by a relationship modified after an empirical equation deduced by Bagnold, but which also has a theoretical basis. For grain diameters greater than 0.05 cm (coarse sands and coarser) the threshold occurs after the boundary layer has become turbulent and is best predicted with an empirical curve related to the wave period. This involves a dimensionless number which represents the ratio of the acceleration forces to the effective gravity force acting on the grains. (Knapp-USGS) W74-04065

MUCILAGINOUS MATRIX OF SOME ESTUARINE SANDS IN CONNECTICUT,

Connecticut Univ., Storrs. Dept. of Geology and Geography.

For primary bibliographic entry see Field 2L. W74-04066

SILCRETES AND ASSOCIATED SILICA DIAGENESIS IN SOUTHERN AFRICA AND AUSTRALIA,

Department of Mines, Wellington (New Zealand).

D. Smale.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1077-1089, December 1973. 8 fig, 39 ref.

Descriptors: *Diagenesis, *Silica, *Chemical precipitation, Quartz, Groundwater movement, Silicates, *Africa, *Australia. Identifiers: Silcretes.

Five types of silcrete are recognized in Australia and Southern Africa: terrazzo, conglomeratic, Albertinia, opaline and fine-grained massive, and quartzitic. Of these the terrazzo is the primary and most abundant form. The conglomeratic and Albertinia types are derivatives of it, but the others are distinct and much rarer. The terrazzo variety is mostly pale buff or yellowish grey, but may also be green or purplish brown. It consists of a framework of angular to subrounded quartz grains, some showing effects of solution, set in a matrix of amorphous, cherty or opaline silica containing abundant leucoxene. The conglomeratic type consists of brecciated terrazzo in a silcrete matrix. In the Albertinia type quartz detritus is almost absent. The rarer forms are mostly pure common opal or chalcedony, either massive or porous. The quartzitic type is the response of a sedimentary orthoquartzite to the silcrete-forming process. On Spilsby Island, South Australia, silica-rich solutions rising to meet downward percolating solutions with NaCl, Na₂SO₄, Fe₂O₃ or MgO or of lower pH cause the silica deposition. Other widespread occurrences may have formed by accumulation through evapotranspiration. The quartzitic type forms by authigenic overgrowths in detrital quartz grains. (Knapp-USGS) W74-04067

SUPRATIDAL ENVIRONMENT AND GEOCHEMISTRY OF SOME RECENT DOLOMITE CONCRETIONS, BROAD SOUND, QUEENSLAND, AUSTRALIA,

Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

For primary bibliographic entry see Field 2L. W74-04069

DETERMINATION OF FALLOUT CS-137 AND NATURALLY OCCURRING GAMMA-RAY EMITTERS IN SEDIMENTS,

Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

For primary bibliographic entry see Field 5B. W74-04190

EVALUATION OF GROUNDWATER RESOURCES IN LIVERMORE VALLEY, CALIFORNIA,

California Univ., Berkeley. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2F. W74-04201

MEASUREMENTS OF BEACH PROCESS VARIABLES, OUTER BANKS, NORTH CAROLINA,

Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

R. Dolan, J. C. Ferm, and D. S. McArthur.

Available from NTIS as AD-686 681, for \$6.00 paper copy, \$1.45 microfiche. Technical Report No. 64, prepared for Office of Naval Research, Geography Branch, January 1969. 79 p, 7 fig, 2 tab, 10 ref, 10 append, 7 photos. Nonr-1575(03).

Descriptors: Beaches, Sediments, *Waves(Water), Water levels, Littoral, *Ocean currents, *Beach erosion, Coasts, Shallow water, *North Carolina, *Barrier islands.

Identifiers: Bottom configuration, Surf zone, Littoral currents, Wave characteristics, Outer Banks(NC), Bodie Island(NC).

A series of beach-process experiments was conducted on Bodie Island, North Carolina, during 1963-1964. Included were essentially continuous and simultaneous measurements of subaerial-beach and inshore-bottom configuration, sediment characteristics, wave and swash properties, still-water levels, and currents. Methods of measurement are summarized and the observations made during the 6-month period are presented. (Sinha-OEIS) W74-04205

GEOMETRY AND DEVELOPMENT OF SPIT-BAR SHORELINES AT HORSESHOE COVE, SANDY HOOK, NEW JERSEY,

Columbia Univ., New York. Dept. of Geology.

For primary bibliographic entry see Field 2L. W74-04206

STORMS CAUSING HARBOR AND SHORELINE DAMAGE THROUGH WIND AND WAVES NEAR MONTEREY, CALIFORNIA,

Naval Postgraduate School, Monterey, Calif.

H. L. Bixby, Jr.

Available from NTIS as AD-619 505, for \$6.00 paper copy, \$1.45 microfiche. MS thesis, 1962. 179 p, 85 fig, 4 tab, 16 ref, 5 append.

Descriptors: *California, *Storms, *Harbors, *Weather forecasting, *Meteorological data, Flooding, *Waves(Water), Damages, Winds, Shores, Synoptic analysis, Beach erosion.

Identifiers: *Windstorms, Monterey(CA), Seas, Swell.

To gain information that might lead to forecasting techniques, a complete list of storms for the 50-year period from 1910 to 1960 was made through a search of local newspaper files. The most significant storms, their frequency of occurrence, the synoptic situations with which they were associated, and the hindcasted sea condition that accompanied them are described. Two general types of damaging storms were found to exist: one occurring offshore in the open ocean and causing shoreline erosion and flooding by the action of sea and swell; the other, a local windstorm sweeping across Monterey Bay and causing damage to vessels in the harbor mainly by the combined effects of strong gusty winds and short-period seas generated in the bay. Wave hindcasts were made to facilitate comparisons of storm intensities within each of the two types of storms. These comparisons, in terms of the intensity of wave conditions, were made using a quantity called Damage Potential, a function of the size and duration of the storm waves. Synoptic situations with

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which these storms were associated were classified by a weather-typing system. All storms were found to be associated with one of three principal types. The possibility of an objective-type forecasting technique for the wind-storms is discussed. (Sinha-OEIS)
W74-04208

MODERN SEDIMENTS OF WILLAPA BAY, WASHINGTON: A COASTAL PLAIN ESTUARY.
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-04209

ON WIND TIDES AND LONGSHORE CURRENTS OVER THE CONTINENTAL SHELF DUE TO WINDS BLOWING AT AN ANGLE TO THE COAST,
National Engineering Science Co., Pasadena, Calif.
For primary bibliographic entry see Field 2E.
W74-04210

AN INVESTIGATION OF BOTTOM CHANGES IN MONTEREY HARBOR (1932-1969),
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W74-04211

THE EFFECTS OF WIND AND PRECIPITATION ON THE MODIFICATION OF SOUTH BEACH, CRESCENT CITY, CALIFORNIA INCLUDING AN APPENDIX ON THE FOCUSING OF TSUNAMI ENERGY AT CRESCENT CITY,
Atmospheric Research Group, Altadena, Calif.
For primary bibliographic entry see Field 2E.
W74-04212

TIME DEPENDENT SHEAR STRESS BENEATH A SHOALING WAVE,
Naval Academy, Annapolis, Md.

J. Fisher.
Available from NTIS as AD-749 709 for \$3.00 paper copy, \$1.45 microfiche. Trident Scholar Project Report No 26, May 19, 1972. 102 p, 45 fig, 25 ref, 3 append.

Descriptors: *Waves(Water), *Shear stress, *Beaches, *Coasts, *Shoals.
Identifiers: Shoaling, Incident wave, Particle velocity.

The celerity of a shoaling wave was measured and plotted as a function of the parameter d/L_0 and compared to linear wave theory. A noticeably higher celerity was measured in the free stream than was measured by hot film shear sensors in the boundary layer. Hot film shear sensors were also used to determine the phase relationship between shear stress and free stream particle velocity. Data results indicate that the maximum shear stress in an oscillatory flow field leads the maximum particle velocity by approximately 30 degrees - 35 degrees and that this has increased with distance from the bottom. The phase difference was also found to be dependent upon the length of the incident wave. It is hypothesized that the boundary layer growth and particle velocity increase in an alternately accelerating and decelerating flow field are related such that the maximum velocity gradient du/dy will occur approximately 30 degrees prior to the maximum particle velocity. (Sinha-OEIS)
W74-04213

MONTEREY BAY BIBLIOGRAPHY.
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 2L.
W74-04218

MONTEREY BAY BIBLIOGRAPHY. SUPPLEMENT NUMBER ONE.
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 2L.
W74-04219

BUDGET OF LITTORAL SANDS IN THE VICINITY OF POINT ARGUELLO, CALIFORNIA,
Army Coastal Engineering Research Center, Washington, D.C.

A. J. Bowen, and D. L. Inman.
Available from NTIS as \$6.00 paper copy, \$1.45 microfiche. Technical Memorandum No 19, December 1966. 41 p, 15 fig, 7 tab, 31 ref.

Descriptors: *California, *Sediment transport, *Littoral, *Coastal engineering, Coasts, Shallow water, Climate, Beaches, *Wind erosion, Rivers.
Identifiers: Point Arguello(CA), *Longshore transport, Nearshore, Wave characteristics.

Results are presented of a detailed analysis of the various littoral processes which affect the California Coast between Pismo Beach and Santa Barbara. The method involves the concept of a sand budget based on the transport rates of all significant littoral processes. Each process is examined to assess the sedimentary contributions (credits) and losses (debits). To balance the sediment transports, the region is sub-divided into five cells, the boundaries of which are chosen at positions where the longshore transport of sand has been estimated. Using basic data from maps, surveys, aerial photographs, climatic records, and wave conditions, a quantitative transport rate has been determined for each process in each cell. The results are shown in graphic and tabular form. The budget concept provides a practical tool for coastal engineering problems. However, the difficulty of moving from qualitative trends to quantitative determinations reveals gaps in the present state of knowledge and requirements for further research. (Sinha-OEIS)
W74-04221

INVESTIGATION OF THE VELOCITY STRUCTURE IN THE BOTTOM REGION OF A TURBULENT WAVE FLOW,
For primary bibliographic entry see Field 8B.
W74-04250

ON THE EXTENT OF BOTTOM EROSION IN LARGE RIVERS (UEBER DEN UMFANG DER SCHLENEROSION IN GROSSEN GEWAESSERN).

Bundesanstalt fuer Gewaesserkunde, Coblenz (West Germany).
M. Tipper.
Deutsche Gewaesserkundliche Mitteilungen, Vol 17, No 5, p 125-130, October 1973. 4 fig, 7 tab, 24 ref.

Descriptors: *Erosion, *Channel erosion, *Stream erosion, *Degradation(Stream), *River beds, Streambeds, Bottom sediments, Bed load, Sediment transport, Erosion rates, Dams, Water levels.

Identifiers: *Germany, Rhine River, Elbe River, Danube River.

As a result of tributary regulation, large rivers such as the Rhine, Elbe, and Danube have been cut off, to a considerable extent, from their original bedload supply sources. The material required for bedload transport can, therefore, be taken only from the river's own bed, which leads to continuous degradation of the riverbed and to retrogression of the water level. Normalization and regulation measures, as well as removal of bottom material in the course of dredging operations may also contribute to continuous degradation of the channel. Erosion rates of the Elbe, Rhine, and Danube are of the order of 0.3 to 3 cm per year. Greatest erosion depths are observed at

the Lower Rhine and are due to bedload washout, dredging, and lowering of the bottom as a result of mining activities. Riverbed degradation is particularly pronounced on the downstream side of dams, especially during the first years following completion of the dam. During the initial stage of erosion, the channel may be degraded at a rate of up to 2 m per year. Mean values obtained from observation periods extending over several years differ considerably and fall between 20 cm and 50 cm per year. The large differences result from the varying lengths of the observation periods and from the different characteristics of the bed material in the various erosion zones. Main causes of bottom erosion in rivers such as the Rhine are shown schematically, and erosion on the downstream side of two North American dams and of various dams in the Federal Republic of Germany is tabulated. (Josefson-USGS)
W74-04252

COAGULATION IN ESTUARIES,
North Carolina Univ. Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W74-04257

ERGS,
Ifc Univ. (Nigeria). Dept. of Geology.
I. G. Wilson.
Sedimentary Geology, Vol 10, No 2, p 77-106, October 1973. 21 fig, 2 tab, 37 ref.

Descriptors: *Sands, *Dunes, *Aeolian soils, *Sediment transport, Particle size, Dune sands, Winds, Wind erosion, Sedimentary structures, Deserts.

Ergs (areas of aeolian sand deposits) have bed forms with a 3-order hierarchy of ripples, dunes and draas (large sandy bed forms). Ergs may occur in any relatively vegetation-free area with an adequate sand supply. The virtual absence of ergs from highland areas is attributed largely to acceleration and divergence of the winds which makes the sandflow undersaturated. Ergs with thick sand deposits and draa development in the Sahara, Arabia and Asia are contrasted with thinner dune ergs in Australia which lack draa development. Sand thickness, proportion of sand cover, bed-form height, spacing and orientation vary in a significant way with position within the Algerian ergs. This may partly be due to regional variations in the wind regime but more probably to regional grain-size variations which, because they determine the threshold velocity of sand movement, control the effective wind regime in an area. Grain-size variations can be interpreted from aerial photographs to a large extent because of their effect on the size and shape of the bed form. In the northern Algerian ergs, regional patterns of sandflow may vary according to the grain size and there is no simple relation between wind directions and the draa trends in any area. (Knapp-USGS)
W74-04264

SEDIMENT PRODUCTION IN A SMALL APPALACHIAN WATERSHED DURING SPRING RUNOFF: THE EATON BASIN, 1970-1972,
McGill Univ., Montreal (Quebec). Dept. of Geography.
M. A. Carson, C. H. Taylor, and B. J. Grey.
Canadian Journal of Earth Sciences, Vol 10, No 12, p 1707-1734, December 1973. 17 fig, 2 tab, 42 ref.

Descriptors: *Sediment yield, *Erosion, Scour, Stream erosion, *Small watersheds, *Canada, Sediment load, Mathematical models, Simulation analysis.

Identifiers: Eaton Basin(Quebec).

Sediment yield was measured in an IHD representative basin, the Eaton River basin (86 sq km in

Field 2—WATER CYCLE

Group 2J—Erosion and Sedimentation

area), in the Quebec Appalachians. The basin is dominantly forest covered, contains no large settlement, and shows little human disturbance that might affect sediment production. The suspended load of the Eaton River was studied in detail during the spring runoff periods of 1970 and 1971. Sediment transport rates are well below capacity and sediment yields are lower than might have been expected from data in the United States. Suspended sediment originates primarily from scour of the banks of the channel network. Sediment concentrations show a systematic increase with basin area (or distance downstream), unlike previous data from the midwestern United States. The sediment rating curve approach is a very good predictor of sediment transport rates. The difference in loads between 1970 and 1971 floods and residuals from the sediment rating curves are considered in a simulation model of sediment production from bank erosion based on the changing shear resistance of bank sediment during a fluctuating hydrograph. (Knapp-USGS) W74-04267

THE SIGNIFICANCE OF ION EXCHANGE TO INTERSTITIAL SOLUTIONS IN CLAYEY SEDIMENTS,
Geological Survey of South Australia, Adelaide.
For primary bibliographic entry see Field 2K.
W74-04268

SOME ASPECTS OF THE CA AND SR WEATHERING CYCLE IN THE LAKE KINNERET (LAKE TIBERIAS) DRAINAGE BASIN,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
A. Singer, and J. Navrot.
Chemical Geology, Vol 12, No 3, p 209-218, November 1973. 1 fig, 3 tab, 24 ref.

Descriptors: *Weathering, *Water chemistry, *Clay minerals, Basalts, Lakes, Carbonates, Bottom sediments, *Calcium, *Strontium, Leaching, Bicarbonates.
Identifiers: *Israel(Lake Kinneret).

Sr/Ca ratios in the clay weathering products of basalt rocks from the Lake Kinneret drainage basin in Israel are very similar to the ratios in the rocks, indicating similar depletion intensities for the two elements. In the clays from the scoriae and some lapilli tuffs the ratios were somewhat higher than in the corresponding rocks, indicating preferential retention of strontium in the clays. The ratio in drainage water from these areas was much lower than that obtained by mass balance calculations. The Sr/Ca ratio in Jordan river water draining primarily limestone areas is 0.0023. Very high Sr/Ca ratios in Lake Kinneret water were attributed to the influence of saline sublacustrine springs. The carbonate fraction from recent lake sediments has the Sr/Ca ratios characteristic for calcite precipitated biogenically in marine environments. The relative strontium enrichment of the lake water may be explained by the intensive precipitation of carbonates with low strontium distribution coefficients. (Knapp-USGS) W74-04269

ASSESSMENT OF COASTAL CHANGES WITH THE AID OF PHOTOGRAVIMETRIC AND COMPUTER-AIDED TECHNIQUES,
University Coll. of Wales, Aberystwyth. Dept. of Geography.
For primary bibliographic entry see Field 7B.
W74-04271

EXPERIENCES WITH THE CORRECTION OF DISORDERED STREAMS OF THE ALPINE TYPE, (IN ITALIAN),
For primary bibliographic entry see Field 4D.
W74-04276

2K. Chemical Processes

EFFECT OF POLYESTER FIBER PROCESSING EFFLUENTS ON WATER QUALITY,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5A.
W74-03761

THE INTERACTION OF WATER WITH ORGANIC SOLUTE SPECIES,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 1B.
W74-03762

CATION ADSORPTION AND DESORPTION RATES IN NATURAL WATER STUDIES,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-03765

THE CHEMISTRY OF CADMIUM IN NATURAL WATER-I: A STUDY OF CADMIUM COMPLEX FORMATION USING THE CADMIUM-SPECIFIC-ION ELECTRODE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W74-03775

WATER RESOURCES OF THE NEW JERSEY PART OF THE RAMAPO RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-03806

WATER-LEVEL DECLINES AND GROUND-WATER QUALITY, UPPER BLACK SQUIRREL CREEK BASIN, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-03808

WATER RESOURCES OF THE NORTHERN CHEYENNE INDIAN RESERVATION AND ADJACENT AREA, SOUTHEASTERN MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-03809

WATER AVAILABILITY AND GEOLOGY IN MARION COUNTY, ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 4B.
W74-03810

WATER AVAILABILITY IN MOBILE COUNTY, ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 4B.
W74-03811

SELENIUM IN NEBRASKA'S GROUNDWATER AND STREAMS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 5B.
W74-03813

GROUNDWATER DATA IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES, CALIFORNIA, SPRING 1970 TO SPRING 1973,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-03814

CHEMICAL QUALITY OF SURFACE WATER IN THE EASTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5A.
W74-03817

BOREHOLE RECHARGE: THE COMPATABILITY OF RECHARGE WATER WITH THE AQUIFER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-03822

BASIC TYPES OF RECENT BOTTOM SEDIMENTS OF THE MEDITERRANEAN SEA, THEIR MINERALOGY AND GEOCHEMISTRY (OSNOVNYYE TIPY SOVREMENNYYKH DONNYKH OSADKOV SREDIZEMNOGO MORYA, IKH MINERALOGIYA I GEOKHIMIYA),
Adademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 2J.
W74-03828

STABILITY OF DILUTE STANDARD SOLUTIONS OF ANTIMONY, ARSENIC, IRON AND RHENIUM USED IN COLORIMETRY,
Loughborough Univ. of Technology (England). Dept. of Chemistry.
A. A. Al-Sibaai, and A. G. Fogg.
Analyst, Vol 98, No 1171, p 732-738, October 1973. 8 tab, 11 ref.

Descriptors: *Stability, *Colorimetry, Storage, *Iron, Heavy metals, Aqueous solutions, Light.
Identifiers: Standard solutions, *Antimony, *Arsenic, *Rhenium.

The stability of dilute standard solutions of Sb (4 micrograms/ml), As (20 micrograms/ml), Fe (50 micrograms/ml), and Re (5 micrograms/ml) used in colorimetry was studied by colorimetric procedures over a period of two months. The solutions were stored in soda-glass, borosilicate glass, and rigid polyethylene containers. The dilute standard antimony solutions, prepared either by dissolving antimony potassium tartrate in water, or by dissolving elemental antimony in sulphuric acid and diluting the solution with water, were found to be stable (i.e., to deteriorate by less than 3 percent) over a period of 50 days. Antimony solutions containing hydrochloric acid deteriorated rapidly, however. The dilute standard arsenic solutions prepared either by dissolving arsenic (III) oxide in sodium hydroxide solution and then neutralizing the solution with hydrochloric acid, or by dissolving sodium hydrogen arsenite heptahydrate in water, were found to be stable. Arsenic (III) in the former standard solution was oxidized slowly by dissolved oxygen, but the total arsenic present in the solution remained unchanged and could be determined by the molybdenum-blue method. An iron (III) standard solution, 0.06 M in hydrochloric acid and prepared from ammonium iron (III) sulphate, was stable for at least 2 months, as was a standard potassium perfronate solution in a buffer solution of pH 6. Light in the laboratory and the material of the containers did not adversely affect the solutions reported to be stable. (Little-Battelle) W74-03842

NITRATE DETERMINATION BY A MODIFIED CONWAY MICRODIFFUSION METHOD,
Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
For primary bibliographic entry see Field 2G.
W74-03845

DIFFERENTIAL ELECTROLYTIC POTENTIOMETRY WITH PERIODIC POLARISATION,

WATER CYCLE—Field 2

Chemical Processes—Group 2K

PART XXI. INTRODUCTION AND INSTRUMENTATION,
Exeter Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-03859

DIRECT DETERMINATION OF SULFIDE BY RAPID DIRECT CURRENT POLAROGRAPHY,
Melbourne Univ., Parkville (Australia). Dept. of Physical Chemistry.
D. R. Canterford.
Analytical Chemistry, Vol 45, No 14, p 2414-2417, December 1973. 3 fig, 2 tab, 16 ref.

Descriptors: *Sulfides, *Aqueous solutions, *Pollutant identification, Chemical analysis, *Polarographic analysis, Electrolytes, Hydrogen ion concentration, Anions, Iodides, Chlorides, Bromides.
Identifiers: DC Polarography, Detection limits, Buffers, Chemical interference, Cyanides, Hydroxyl ion, Bisulfites, Thiocyanates, Sensitivity, Limiting current.

The rapid polarographic method for the direct determination of sulfide ion in aqueous solution has been investigated in detail. As well as comparing the sensitivity of the conventional and rapid methods, the possibility of interference from other anions and the effect of pH of the supporting electrolyte have been studied. The detection limit under rapid polarographic conditions was 4 microM sulfide, compared with 3 microM under conventional conditions. Interference studies involved the recording of polarograms of 0.0015 M sulfide in the presence and absence of 0.01 M potentially interfering anion. The rapid technique overcomes the anticipated anionic interferences. Under both rapid and conventional conditions, the total limiting current is independent of pH, which is an advantage in analytical applications as it eliminates the need to buffer the supporting electrolyte prior to analysis. Supporting electrolytes of pH less than 8 or 9 are not recommended because of the possibility of loss of sulfide as hydrogen sulfide. (Holman-Battelle)
W74-03865

A LIQUID ION-EXCHANGE NITRATE-SELECTIVE ELECTRODE BASED ON CARBON PASTE,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-03884

WATER SAMPLING AND LABORATORY SERVICE,
Bridgeport Hydraulic Co., Conn.
For primary bibliographic entry see Field 5A.
W74-04024

A BRIEF WATER-RESOURCES APPRAISAL OF THE TRUCKEE RIVER BASIN, WESTERN NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 4A.
W74-04047

LOSS OF MERCURY FROM WATER DURING STORAGE,
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 5A.
W74-04048

HYDROGEOLOGY OF THE PRINCIPAL AQUIFERS IN SULLIVAN AND GREENE COUNTIES, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 2F.
W74-04049

FIELD WATER-QUALITY INFORMATION ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 THROUGH SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W74-04054

SILCRETES AND ASSOCIATED SILICA DIAGENESIS IN SOUTHERN AFRICA AND AUSTRALIA,
Department of Mines, Wellington (New Zealand).
For primary bibliographic entry see Field 2J.
W74-04067

PHREATIC VS. VADOSE DIAGENESIS: STRATIGRAPHY AND MINERALOGY OF A CORED BOREHOLE ON BARBADOS, W.I.,
Brown Univ., Providence, R.I. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2F.
W74-04068

CONTROL AND DISTRIBUTION OF URANIUM IN CORAL REEFS DURING DIAGENESIS,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.
G. Gvirtzman, G. M. Friedman, and D. S. Miller.
Journal of Sedimentary Petrology, Vol 43, No 4, p 985-997, December 1973. 12 fig, 5 tab, 21 ref. AFC Contract AT(30-1)-3836.

Descriptors: *Coral, *Uranium radioisotopes, *Diagenesis, Calcium carbonate, *Reefs, Water chemistry, Mineralogy, *Calcite.
Identifiers: *Red Sea, Aragonite.

About 2 ppm of uranium was found in the aragonitic skeletons of modern scleractinian corals; this is a constant value, regardless of occurrence, anatomy, or taxonomy. The presence of cement of aragonite or high-magnesium calcite usually raises the concentration of bulk samples to about 3 ppm. Modern corals may contain up to 50% of cementing minerals. Organisms, such as corals and coraline algae, while secreting their skeleton, discriminate against the uptake of uranium, whereas the uptake of uranium by mineral cements is less restrained. Aragonite cement contains about 3.6 ppm high-magnesium calcite cement, 2.6 ppm uranium. During leaching by freshwater, the aragonite of the skeletons of corals dissolves out. This creates hollow molds which fill with drusy low-magnesium calcite. In emergent reefs from the shores of the Red Sea which display the effects of progressive diagenesis, this calcite is enriched in uranium (3.9 ppm) beyond that found in marine cements. Second-generation calcite which fills original voids in the corals from the emergent reefs contains a lower level of uranium concentration (1.3 ppm). The level of concentration of uranium in low-magnesium calcite of diagenetically altered corals is a function of the availability of uranium in meteoric waters. In aragonite as well as high- and low-magnesian calcite, uranium replaces calcium or occupies lattice vacancies in the crystal lattice. (Knapp-USGS)
W74-04070

ABSORPTIOMETRIC DETERMINATION OF TRACE AMOUNTS OF SULPHIDE ION IN WATER,
Mosul Univ. (Iraq). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04072

APPLICATION OF THE CARBON CUP ATOMISATION TECHNIQUE IN WATER ANALYSIS BY ATOMIC-ABSORPTION SPECTROSCOPY,
Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).
For primary bibliographic entry see Field 5A.

W74-04073

THE INUNDATION REGION OF THE DANUBE,
KM 1402,
G. Petrovic.
Arch Hydrobiol Suppl. Vol 44, No 1, p 24-33. 1972.
Illus. English summary.
Identifiers: *Danube River, *Inundation, *Yugoslavia(Apatin), Hydrochemical studies.

Due to the digging of the Danube channel the inundation region near Apatin was fully isolated by a dam from the river Danube. The hydrochemical relations in the shallow basin (only 1-6 m in depth) differ completely from those of the Danube.--Copyright 1973, Biological Abstracts, Inc.
W74-04080

DETERMINING FORMATION WATER RESISTIVITY FROM CHEMICAL ANALYSIS.
Sinclair Oil and Gas Co., Tulsa, Okla.
E. J. Moore, S. E. Szasz, and B. F. Whitney.
Journal of Petroleum Technology, Vol 18, No 3, p 373-376, March, 1966. 4 fig, 3 tab, 4 ref.

Descriptors: *Resistivity, *Water analysis, Inorganic compounds, *Electrical well logging, Rock properties, Conductivity, Connate water, Porosity, Ionization, Solutes, Brines.
Identifiers: *Equivalent sodium chloride, *Cation correction factor, *Anion correction factor.

An accurate value of formation water resistivity is necessary in order to make reliable calculations of fluid saturation from electrical well logs. In the absence of a measured value of formation water resistivity, the resistivity can be found from the chemical analysis provided the concentrations of the various ions can be converted to equivalent concentrations of sodium and chloride ions. Conversion by the use of constant multipliers (methods of Dunlap and Hawthorne (1951)) may lead to large errors at high salt concentrations. Two new methods were developed which take into account not only other ions than sodium and chloride, but also the total dissolved salts. For solutions similar in composition to actual formation waters, these methods yield equivalent sodium chloride concentrations which are within plus or minus 5% of the value determined from the measured resistivity values. Reliable values for porosity and connate water are obtained at high salt concentrations. In the laboratory where both resistivity and chemical analysis determinations are made, the methods furnish a quick check on the consistency of the measurements. (Gray-NWWA)
W74-04145

STABILITY FIELD DIAGRAMS AS AIDS IN IRON CHEMISTRY STUDIES,
Geological Survey, Denver, Colo. Water Resources Div.

J. D. Hem.
Journal American Water Works Association, Vol 53, No 2, p 211-228, February, 1961. 6 fig, 13 ref.

Descriptors: Groundwater, *Chemical properties, *Oxidation-reduction potential, *Solubility, *Iron, Iron compounds, *Hydrogen ion concentration.
Identifiers: Stability field diagrams.

In many natural waters, the solubility of iron is controlled by the redox potential, pH, and concentrations of carbonate and sulfur anionic species. These factors can be summarized by means of stability field diagrams, which are graphs having redox potential as the ordinate and pH as the abscissa. In the absence of chemical complexing and excessive amounts of carbonate, the pH and iron content of a ground water may serve as an index of the redox potential of the water in its natural environment. The stability field diagrams summarize the conditions required for stability of solutions containing 0.01-100 ppm iron, and indicate some

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Group 2K—Chemical Processes

factors that control solution and precipitation of iron in natural water. (Campbell-NWWA)
W74-04163

THE SIGNIFICANCE OF ION EXCHANGE TO INTERSTITIAL SOLUTIONS IN CLAYEY SEDIMENTS,
Geological Survey of South Australia, Adelaide.
S. B. Devine, R. E. Ferrel, Jr., and G. K. Billings.
Chemical Geology, Vol 12, No 3, p 219-228,
November 1973. 3 fig, 22 ref. USGS Contract 14-08-0001-108077.

Descriptors: *Ion exchange, *Clays, *Bottom sediments, *Connate water, *Water chemistry, Clay minerals, Sea water, Chemical reactions, Mineralogy, Laboratory tests.

The ion population in interstitial solutions in clayey sediments is distributed by Donnan chemical potential forces between inner and outer (micellar and intermicellar, respectively) solutions around clay-mineral particles. Extraction procedures which involve a single dilution step disturb the ion distribution between inner and outer solutions. The relationship of solutions extracted by squeezing to Donnan equilibrium remains relatively untested. A method that may distinguish the inner and outer solutions in the laboratory is suggested. It involves multiple dilution extractions from several aliquots of a single sediment sample. Each aliquot has a different sediment/water ratio, and the line of best fit to the ion activities of extracted solutions may be extrapolated to the in situ sediment/water ratio. Efforts to distinguish inner and outer solutions in marine clayey sediments ought to be made because their existence may have importance to the study of the chemical evolution of such sediments. (Knapp-USGS)
W74-04268

ON SALTWATER HOT SPRINGS IN THE COAST AREA OF WESTERN ANATOLIA, TURKEY (ÜBER SALZWASSER-THERMEN IM KUSTENLAND VON WEST-ANATOLIEN, TURKEI),
Aegean Univ., Bornova (Turkey).
For primary bibliographic entry see Field 2F.
W74-04270

THE INFLUENCE OF SUSPENDED PARTICLES ON THE PRECIPITATION OF IRON IN NATURAL WATERS,
Imperial Coll. of Science and Technology, London (England). Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-04272

SOME PHYSICAL AND CHEMICAL PROPERTIES OF THE GULF OF CORINTH,
Washington Univ. Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-04273

BASE OF FRESH GROUND WATER (APPROXIMATELY 3,000 MICROMHOS) IN THE SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-04274

WATER RESOURCES OF WISCONSIN, ST. CROIX RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-04275

2L. Estuaries

CHANGES IN CHEMICAL COMPOSITION AND PHYSICAL PROPERTIES OF A HEAVY RESIDUAL OIL WEATHERING UNDER NATURAL CONDITIONS,

Nova Scotia Technical Coll., Halifax.
For primary bibliographic entry see Field 5B.
W74-03877

ESTUARIES UNDER ATTACK,
Oregon State Univ. Extension Service, Corvallis. Marine Advisory Program.
For primary bibliographic entry see Field 6G.
W74-04033

MUCILAGINOUS MATRIX OF SOME ESTUARINE SANDS IN CONNECTICUT,

Connecticut Univ., Storrs. Dept. of Geology and Geography.
L. Frankel, and D. J. Mead.

Journal of Sedimentary Petrology, Vol 43, No 4, p 1090-1095, December 1973. 7 fig, 19 ref. NSF Grant GA-32067.

Descriptors: *Bottom sediments, *Estuaries, *Algae, *Aquatic microorganisms, Bacteria, *Connecticut.

Identifiers: *Mucilage, *Cementation(Natural).

Mucilaginous materials which apparently are the extracellular and autolytic products of microorganisms living on the grains and within the interstices fill many of the voids below the water-sediment interface in some estuarine sands in Connecticut. These substances are viscid, viscous, and elastic. They act as grain binders and cushions to deter extensive disruption of sediment by organisms. (Knapp-USGS)
W74-04066

SUPRATIDAL ENVIRONMENT AND GEOCHEMISTRY OF SOME RECENT DOLOMITE CONCRETIONS, BROAD SOUND, QUEENSLAND, AUSTRALIA,

Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

P. J. Cook.

Journal of Sedimentary Petrology, Vol 43, No 4, p 998-1011, December 1973. 9 fig, 3 tab, 29 ref.

Descriptors: *Dolomite, *Diagenesis, *Tidal marshes, Shallow water, Sedimentation, Chemical precipitation, Estuaries, *Australia, Barrier islands.

Identifiers: *Broad Sound(Aust.).

Extensive supratidal flats composed dominantly of noncalcareous muds occur on the landward side of thick mangrove swamps around the margins of Broad Sound, central Queensland coast. During inundation by spring or storm tides, abundant algal growth takes place on the mudflats but for the rest of the time they are subaerially exposed and subject to desiccation. As a result, a thin veneer of evaporites covers the surface of the flats and large gypsum crystals form just below the surface. Intertidal pore waters are hypersaline, with salinities in excess of 120 ppt being recorded. The Mg/Ca and K/Ca ratios become particularly high in these brines, attaining values of up to 9.9 and 2.2 respectively, primarily as a result of the removal of Ca from solution, in the form of gypsum. The supratidal muds are generally low in calcium carbonate but dolomitic concretions do occur in the Charon Point area. These concretions are composed of low magnesium calcites, and calcian dolomites with a compositional range of Ca0.59 Mg0.41 C03 to Ca0.65 Mg0.35 C03. Electron microprobe, X-ray diffraction and whole rock analyses all suggest that the dolomites have

formed by dolomitization of calcite. The dolomitization is associated with ferruginization, and possibly also phosphatization. Radiocarbon age determinations on associated wood and shell material and on the concretions indicate that the dolomitization has occurred within the past 3,000 years. (Knapp-USGS)
W74-04069

PHYSICAL EFFECTS OF MAINTAINING DRAINAGE CHANNELS IN NORTH CAROLINA'S COASTAL AREA,
Soil Conservation Service, Raleigh, N.C.
For primary bibliographic entry see Field 2E.
W74-04075

DISCHARGE AND FLOW DISTRIBUTION, COLUMBIA RIVER ESTUARY,

Geological Survey, Bay St. Louis, Miss.

For primary bibliographic entry see Field 5B.
W74-04172

IMPACT OF A POWER PLANT ON A SUB-TROPICAL ESTUARINE ENVIRONMENT,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 5C.
W74-04189

A MODEL OF SALT INTRUSION IN A PARTIALLY MIXED ESTUARY,

New York Inst. of Ocean Resources, N.Y.

For primary bibliographic entry see Field 5B.
W74-04204

GEOMETRY AND DEVELOPMENT OF SPIT-BAR SHORELINES AT HORSESHOE COVE, SANDY HOOK, NEW JERSEY,

Columbia Univ., New York. Dept. of Geology.

W. E. Yasso.

Available from NTIS as AD-601 221, for \$3.00 paper copy, \$1.45 microfiche. Technical Report No. 5, prepared for Office of Naval Research, Geography Branch, 1964. 104 p, 56 fig, 2 tab, 91 ref, 4 plates. Nonr 266(68).

Descriptors: *New Jersey, *Beaches, *Sand spits, *Sand bars, *Shores, *Sedimentation, *Shallow water, Hurricanes, Fetch.
Identifiers: Sandy Hook(NJ), Beach changes, Wind generated waves.

Because only local wind-generated waves are effective in causing beach changes along the Sandy Hook Bay Shoreline, the Horseshoe Cove-Arrowsmith Beach area offers an uniquely simplified environment for study of foreshore spit-bar growth. Regression analyses of geometric elements of lower-foreshore spit-bar transverse profiles showed that no single lower-foreshore spit-bar can accurately be described as the progenitor of the next upper-foreshore spit-bar to be formed. An upper-foreshore spit-bar grows from a nucleus of sediment contributed by many lower-foreshore, spit-bars, each of which maintains geometric similarity in transverse shape while migrating landward on the beach. Mechanical analyses of 33 samples of lower-foreshore spit-bar crest sediment show a persistent decrease in mean diameter toward the distal terminus. Spit-bars, both in plan and transverse profile, seem to represent an equilibrium form that is maintained even under extreme tide range and attack of large waves such as those generated by Hurricane Donna in 1960. Spit-bar growth stages and log-spiral parameters for upper-foreshore spit-bars were combined with plan configuration of Arrowsmith Beach, the feeder beach, in order to create a model of shoreline development in which pure translation of the entire shoreline to the southeast, in annual increments, is sufficient to explain observed changes. (Sinha-OEIS)
W74-04206

WATER CYCLE—Field 2

Estuaries—Group 2L

WIND TUNNEL MEASUREMENTS OF THE WIND DISTURBANCE FIELD OF A MODEL OF THE BUZZARDS BAY ENTRANCE LIGHT TOWER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
E. L. Mollo-Christensen, and J. R. Seesholtz.
Available from NTIS as AD-640 628, for \$6.00 paper copy, \$1.45 microfiche. Prepared for Naval Underwater Weapons Research and Engineering Station, Ocean Environment Study, September 1966. 19 p, 11 fig, 1 tab, 1 ref. N140-(122)77626B.

Descriptors: Model studies, Winds, Measurement, *Lighthouses, *Bays, *Air-water interfaces, *Wind velocity, Coasts, *Massachusetts.
Identifiers: Buzzards Bay(MA), *Wind tunnel tests, Air-sea interaction.

Wind tunnel model tests were carried out to measure the wind interference created by the Buzzards Bay Entrance Light Tower in the atmospheric boundary layer. Tunnel measurements of wind profile were carried out at certain positions in the vicinity of the tower for several wind directions. The results indicate that at a distance of 50 feet from the tower the wind velocity profile may change about six percent, and larger changes are observed in certain special cases. Interference effects are obvious when the profiles from the 180 deg and 270 deg winds are compared, as the 270 deg wind results in decelerated flow and the 180 deg wind accelerated flow at the test point. In view of the high Reynold's number the rather uniform modification (displacement of the vertical velocity profile in all cases) is not surprising. It was found that with the wind from 225 deg, the maximum change of velocity attributed to the tower is 2% and is generally less, except for an area of high turbulence within 4 inches of the floor with the boundary layer fence installed when velocity changes of up to minus 6 percent are evident. (Sinha-OEIS) W74-04209

MODERN SEDIMENTS OF WILLAPA BAY, WASHINGTON: A COASTAL PLAIN ESTUARY,
Washington Univ., Seattle. Dept. of Oceanography.
R. S. Andrews.
Available from NTIS as AD-619 898, for \$6.00 paper copy, \$1.45 microfiche. Technical Report No. 118, Reference M65-8, May 1965. 43 p, 11 fig, 5 tab, 46 ref, 4 append. AEC-AT(45-1)-1725, Nonr-477(10), Nonr-477(37).

Descriptors: *Columbia River, *Coasts, *Estuaries, *Sediment transport, *Littoral drift, *Washington.
Identifiers: Willapa Bay(Wash), Shoaling, Spits, Tidal flats.

Willapa Bay, a coastal plain estuary, contains extensive tidal flats cut by channels and distributaries. Well-sorted fine sand occurs throughout the bay, with increasing amounts of silt- and clay-size sediment present on the tidal flats near the south end of the bay and adjacent to the mouths of rivers flowing into the bay. The channels are generally scoured of this fine sediment by strong bottom currents. Organic carbon and organic nitrogen contents increased with decreasing mean grain-size, and the ratio of carbon to nitrogen revealed two types of organic matter in the bay. One type, associated with the fine-grained sediment on the tidal flats, had an average ratio of 13.8; the other type, associated with the coarser channel sediments, had an average ratio of 6.1. At the bay entrance a littoral drift to the north results in extensive shoaling north of Leadbetter Point and erosion on Cape Shoalwater. A southward migration of the channel through the tidal delta off the bay entrance indicates a littoral drift to the south in this area. Spits and shoals forming inside the bay entrance are a result of a net influx of fine sand into the bay from the eroding cape. The distribution of brackish-water to marine suites of

Foraminifera is closely related to the sedimentary environments in the bay. Heavy minerals indicate source areas for the sediment from the Columbia River drainage basin as well as the Willapa Bay drainage basin. Fine sand on the tidal flats east of Long Beach Peninsula is a relict of the growth of the spit. (Sinha-OEIS)
W74-04209

AN INVESTIGATION OF BOTTOM CHANGES IN MONTEREY HARBOR (1932-1969),
Naval Postgraduate School, Monterey, Calif.
R. J. Lennox.

Available from NTIS as AD-706 032, for \$3.00 paper copy, \$1.45 microfiche. MS thesis, June 1969. 179 p, 12 fig, 4 tab, 8 ref, 6 append.

Descriptors: *Harbors, Sedimentation, *Beaches, Breakwaters, *Sediment transport, *Waves(Water), Coasts, Coastal structures, *California, Sands.
Identifiers: Monterey Harbor(Calif), *Shoaling, Nearshore, *Bottom topography.

Bottom changes occurring in Monterey Harbor from 1932-1969 were analyzed by numerical computer methods using 15 selected hydrographic surveys. Results indicate that the major portion of the harbor has been shoaling in the mean since 1932. The long-term shoaling rate has been 0.4 to 4.0 feet per decade in the beach and nearshore zones and along the breakwater; and less than 0.25 feet per decade in the stable outer harbor. The accretion rate averaged 17,500 cubic yards per year from 1932-1969 but only 7,100 cubic yards per year for 1947 to 1969. The shoaling is believed due to the construction of the Coast Guard Breakwater in 1931-1934. It is deduced that prior to 1960 the excess sand was carried into the harbor by littoral transport from Del Monte Beach and by wave currents around the breakwater. Construction of the solid wall on Warf 2 in 1960 cut off the former sand supply. Local redistribution of sand in the beach and nearshore zones of the harbor is large and results in areas of significant accretion and erosion between surveys. Dredging operations have had only short-term effectiveness because the spoil has been retained within the harbor. (Sinha-OEIS)
W74-04211

MONTEREY BAY BIBLIOGRAPHY.

Moss Landing Marine Labs., Calif.
Available from NTIS as COM-71-01006 for \$6.00 paper copy, \$1.45 microfiche. Technical Publication 71-1, 1971. D. Baron, editor 259 p.

Descriptors: *California, *Bibliographies, *Marine geology, Coasts, Shores, Beaches, Bays, Oceanography, Resources, Meteorology, Coastal engineering, Recreation, *Marine biology, *Fisheries.
Identifiers: *Monterey Bay(CA), Physical geography.

A partial, provisional bibliography is presented of scientific and general papers, reports, books, and miscellaneous publications which deal directly or indirectly with the Central California Coast. Subject headings include geology, physical geography, oceanography, meteorology, coastal engineering, boats and boating, materials and their protection, description and travel, geography, history, recreation, marine biology, and fisheries and fish culture. Cross reference notes are included. The author index is arranged alphabetically giving date of publication and citation number which identifies the entry in the bibliography. A general index is provided with topics listed alphabetically followed by their subject headings. (See also W74-04219) (Sinha-OEIS)
W74-04218

MONTEREY BAY BIBLIOGRAPHY. SUPPLEMENT NUMBER ONE.

Moss Landing Marine Labs., Calif.
Available from NTIS as COM-73-10300 for \$3.00 paper copy, \$1.45 microfiche. Technical Publication 72-8, 1972. D. Baron, compiler 103 p. SGP2-94.

Descriptors: *California, *Bibliographies, *Marine geology, Coasts, Shores, Beaches, Bays, Oceanography, Resources, Meteorology, Coastal engineering, Recreation, *Marine biology, *Fisheries.

Identifiers: *Monterey Bay(CA), Physical geography.

This is a supplement to the Monterey Bay Bibliography and is presented in the same format. Cross reference notes are included. The author index is arranged alphabetically giving date of publication and citation number which identifies the entry in the bibliography. A general index is provided with topics listed alphabetically followed by their subject headings. (See also W74-04218) (Sinha-OEIS)
W74-04219

FINE STRUCTURE MEASUREMENT OF TEMPERATURE AND MOISTURE OVER THE MONTEREY BAY,

Naval Postgraduate School, Monterey, Calif.
L. R. Colvert.

Available from NTIS as AD-743 702 for \$3.00 paper copy, \$1.45 microfiche. MS thesis, March 1972. 102 p, 43 fig, 23 tab, 5 ref, append.

Descriptors: *California, *Fog, *Prediction, Temperature, Atmospheric pressure, *Moisture, Weather, Measuring instruments, Data reduction, Meteorological data, Visibility, Inversion, Cloud cover, Air-water interfaces, *Air temperature.

Identifiers: Monterey Bay(CA), *Fog bank, Vertical profiles, Mixing ratio, Upper air soundings, *Stratus clouds.

Temperature, pressure and moisture measurements were made from the surface to 2,000 ft over the Monterey Bay during several different synoptic conditions. Data collection was made from ground level and a helicopter. There are many small scale fluctuations in the fine structure of the lower layers of the atmosphere that affect the formation of fog in small localized areas. The data indicate a close relationship between the inversion layer and fog formation; for example, fog formation occurred at the base of the inversion on four different profiles. Evidently, fog is not triggered by a large change in one of its associated parameters, but rather by very small changes in one or several of these parameters. These small changes may be local and shortlived resulting in limited fog, or they may be of synoptic scale and result in wide-spread fog. Large areas in which fog is prevalent normally are predicted from the daily upper soundings now available; however, more knowledge and data on a finer scale appears to be necessary to predict fog accurately on a local basis. (Sinha-OEIS)
W74-04222

AN OCEANOGRAPHIC INVESTIGATION OF THERMAL CHANGES IN MONTEREY BAY, CALIFORNIA, SEPTEMBER 1971 - JANUARY 1972.

Naval Postgraduate School, Monterey, Calif.
J. J. McClelland, Jr.
Available from NTIS as AD-743 084 for \$3.00 paper copy, \$1.45 microfiche. MS thesis, March 1972. 101 p, 52 fig, 12 ref.

Descriptors: *California, Seasonal, *Upwelling, *Currents(Water), *Coasts, Isotherms, *Water temperature.

Identifiers: Monterey Bay(CA), Davidson current, *Sea surface temperature, Thermal structure, Geostrophic currents.

Field 2—WATER CYCLE

Group 2L—Estuaries

Nine oceanographic stations in Monterey Bay were occupied on at least weekly intervals from 21 September 1971 through 28 January 1972. During this period the three oceanic seasons described by previous investigators were observed. Measured thermal conditions were compared to previously derived long-term mean values. The magnitude of the short-period thermal fluctuations was comparable to that noted in earlier investigations. The changes in seasonal thermal structure were greater and more rapid than climatology implied. Unusually weak upwelling in August 1971 was followed in October by stronger than normal upwelling. This resulted in an interruption in the Oceanic Period and delayed the start of the Davidson Current regime in the bay. The network of regularly occupied stations was more extensive than had been previously possible. Quasi-synoptic observations between two offshore stations indicated north-south geostrophic current velocity components on the order of 2 to 4 cm/sec. (Sinha-OEIS)
W74-04223

THE DESIGN OF THE MONITORING SYSTEM FOR THE THERMAL EFFECT STUDY OF THE SURRY NUCLEAR POWER PLANT ON THE JAMES RIVER,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-04246

COAGULATION IN ESTUARIES,
North Carolina Univ. Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W74-04257

'INTERNAL WAVES' ADVANCING ALONG SUBMARINE CANYONS,
Scripps Institute of Oceanography, La Jolla, Calif.
Geological Research Div.
For primary bibliographic entry see Field 2E.
W74-04261

ASSESSMENT OF COASTAL CHANGES WITH THE AID OF PHOTOGRAMMETRIC AND COMPUTER-AIDED TECHNIQUES,
University Coll. of Wales, Aberystwyth. Dept. of Geography.
For primary bibliographic entry see Field 7B.
W74-04271

THE INFLUENCE OF SUSPENDED PARTICLES ON THE PRECIPITATION OF IRON IN NATURAL WATERS,
Imperial Coll. of Science and Technology, London (England). Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-04272

SOME PHYSICAL AND CHEMICAL PROPERTIES OF THE GULF OF CORINTH,
Washington Univ. Seattle. Dept. of Oceanography.
J. J. Anderson, and E. C. Carmack.
Estuarine and Coastal Science, Vol 1, No 2, p 195-202, July 1973. 6 fig, 3 ref. NSF Grant GA-24875; ONR Contract N-000146-7-A-0103-0014.

Descriptors: *Oceanography, *Water circulation, Currents(Water), Bathymetry, Dissolved oxygen, Thermal stratification, Nutrients, *Bays, Water pollution sources.
Identifiers: *Gulf of Corinth, Ionian Sea, Mediterranean Sea.

The Gulf of Corinth is a silled embayment opening into the Ionian Sea on the west and through The Aegean Sea on the east. Winter cooling of the nearshore waters results in convective overturn and renewal of the deep water of the basin.

Renewal at the intermediate depths occurs when Ionian Sea water enters the basin over the sill. The basin acts as a slight nutrient trap. (Knapp-USGS)
W74-04273

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

WATER AVAILABILITY AND GEOLOGY IN MARION COUNTY, ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 4B.
W74-03810

WATER AVAILABILITY IN MOBILE COUNTY, ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 4B.
W74-03811

APPRaisal OF GROUND-WATER AVAILABILITY AND MANAGEMENT PROJECTIONS, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W74-03812

LOWER COST WATER HARVESTING METHODS,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.
K. R. Cooley, L. E. Myers, and G. W. Frasier.
In: Proceedings of the Symposium on Interdisciplinary Aspects of Watershed Management, August 3-6, 1970, Montana State University, Bozeman, p 27-41, 1970, 1 fig., 2 tab., 18 ref.

Descriptors: *Water supply development, *Water harvesting, *Costs, *Water yield improvement.
Identifiers: Vegetation management, Land alteration, Ground cover, Chemical treatments.

Water supplies can be greatly increased by water harvesting, a process of collecting water from areas treated to increase runoff. Four alternative harvest methods are discussed. In the first, land alterations, vegetation is cleared, the soil is conditioned to encourage runoff, and runoff is collected from natural drains or drainage ditches. This method is presently being used in Australia. Vegetation management is accomplished by substituting differing forms of vegetation to encourage runoff. An Arizona experiment using this method increased runoff by 3 inches per year. A third method, chemical treatment, is used to prevent percolation. Some difficulties of erosion and treatment effectiveness have arisen, although encouraging results have been obtained by using sodium methyl silanolate. Ground cover is a method where an impermeable barrier is placed on the land. The lowest cost form of this method is the use of already existing pavement such as highways. Comparing site preparation and catchment construction costs to supply a given water supply for a given site shows that, for inexpensive land, the land alteration methods are the cheapest. As land costs increase, the water repellent chemical method and then the ground cover method become the most economical. (Schroeder-Wisconsin)
W74-03952

DISCHARGE SYSTEM FOR THE A.D. EDMONSTON PUMPING PLANT,
California State Dept. of Water Resources, Sacramento.
R. B. Jansen.

Journal American Water Works Association, Vol 65, No 11, p 710-716, November 1973. 4 fig, 8 photo, 1 tab.

Descriptors: *Dams, *Dam construction, *Water supply development, *Cost-benefit ratio, *Hydraulic valves-butterfly valves, Discharge lines, Surge tanks, Multiple purpose projects, Hydrology, Water distribution(Applied), Water yield improvement, Tunneling, Water delivery, Waterworks, Concrete construction.

The California Water Project includes the highest dam and largest pumping plant in the world. Approximately 450 major construction contracts were involved in this project which distributes water statewide from the mountain watersheds in Northern California to the coastal plains in Los Angeles. The project itself has many precedent setting aspects including project-wide remote control system for instantaneous adjustments. The A.D. Edmonston pumping plant lifts more water against a greater pressure than any other plant in the United States. The pumps in the system are described and then the separate features of the plant, the discharge valves, the manifolds, the discharge lines, the surge tank and the filling and emptying valves are described in detail. A new style of manifold was employed, tunneling was preferred in the discharge lines, and maintenance problems were cured by the use of a butterfly valve in the filling and emptying lines. (Sutton-Florida)
W74-04038

USE OF PHYTOPHAGOUS FISH TO CONTROL AQUATIC PLANTS,
Instytut Rybactwa Srodoladowego, Zabieniec (Poland). Dept. of Fish Culture.
K. Opuszynski.
Aquaculture, Vol 1, No 1, p 61-74, 1972. 4 fig, 29 ref.

Descriptors: *Aquatic weed control, *Fish, *Carp, Water temperature, Heated water, Fisheries, Tropical regions, Eutrophication, Fish diets, Temperature.
Identifiers: *Phytophagous fish, Hypophthalmichthys molitrix, Ctenopharyngodon idella.

Effectiveness of grass carp in control of water weeds depends on several factors, the most important being water temperature, plant species, individual weight of fish, and stock density. Work on acclimatization of *Ctenopharyngodon idella* (grass carp) is at present being carried out in Europe, America, and Africa. This species belongs to the family Cyprinidae and reaches a maximum weight over 30 kg and length over one meter. They are warm water fish, the upper lethal temperature for fry being 38-39°C; however they survive well wintering at 1-2°C. Their oxygen requirements are low and their type of food varies in relation to size. Food coefficients for one-year-old grass carp fry at various temperatures are presented. Foods most desired are soft submerged plants. Aquatic plants readily consumed include *Elodea canadensis*, *Ceratophyllum demersum*, *Potamogeton pectinatus*, and *Myriophyllum spicatum*. Stocking of water bodies heated by thermal power station effluents with grass carp, in a tropical climate as well as in southern Europe, may solve the problem of overgrowth of inland water bodies without use of the traditional methods. The only condition is that the environment must fulfill the vital requirements of the fish. (Jones-Wisconsin)
W74-04106

WATER-MANAGEMENT STUDIES OF A STREAM-AQUIFER SYSTEM, ARKANSAS RIVER VALLEY, COLORADO,
Geological Survey, Pueblo, Colo.
For primary bibliographic entry see Field 4B.
W74-04262

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

3C. Use Of Water Of Impaired Quality

AGRICULTURAL IMPACT ON WATER QUALITY IN WESTERN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-03796

CALCIUM LOSS FROM PLANT ROOTS DURING OSMOTIC ADJUSTMENT,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2I.
W74-03924

IRRIGATED RECREATIONAL TURFGRASS WITH SEWAGE EFFLUENT,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. V. Johnson.

Progressive Agriculture in Arizona, Vol 25, No 5, p 8-9, 15, September-October 1973. 1 fig, 5 ref.

Descriptors: *Turf grasses, *Sewage effluents, *Nitrogen, *Irrigation effects, *Crop response, Arizona, Landscaping, Golf courses, Lawns, Recreation facilities.

Studies at the University of Arizona Turfgrass Research Center show that treated municipal effluent can be beneficially used to irrigate field crops, but when such crops are not grown near the supply, such use is not always economically feasible. Because recreational turfgrasses, used most effectively in small rapidly growing communities, require high nitrogen applications, the use of effluent for this purpose is being demonstrated successfully. Annual consumptive water use by creeping bentgrass, a cool season turfgrass used for golf putting greens in the Tucson area is about 56 inches, and this use is similar for other turfgrasses. Turfgrasses will use an average of 1 pound of nitrogen per thousand feet per month, for an annual nitrogen consumption of approximately 525 pounds per acre. Assuming an average nitrogen concentration of 20 ppm in the effluent, one acre foot of effluent would supply 54 pounds of nitrogen and about 9.7 acre feet would be required to satisfy the nitrogen requirement of an acre of turfgrass for one year. Approximately 5 acre feet of the applied effluent containing less than one ppm nitrate-nitrogen and of excellent overall quality, would be available for recharge of groundwater. Disposal of effluent in this manner does not carry the stigma of pollution hazards associated with field crop irrigation or discharge of effluent into dry stream beds. It is technically feasible for most of the southwestern U.S. where turfgrasses are grown all year. (Paylore-Arizona) W74-03929

GROSS CHEMICAL COMPOSITION OF MURGAB OASIS DESERTIFIED AND ANCIENT-IRRIGATION SOILS (IN RUSSIAN),
I. S. Rabochev, M. P. Aranbaev, A. G. Gaipova, and M. M. Niyazova.

Probl Osvoeniya Pustyn'. 6. p 23-35, 1971, English summary.

Identifiers: *Carbonates(Soils), Chemical composition, Deserts, Irrigation, Silicon, Soils, USSR(Murgab Oasis), Weathering, *Soil chemistry.

The investigated soils originated from thick irrigation deposits and were formed as a result of prolonged irrigation by river mud waters with great amounts of suspended matter. They are characterized by high rate of carbonates and CaCO₃ prevalence over MgCO₃. The high rate of the suspended matter weathering, great amounts of quartz and subsequent soil-formation processes

increase the amount of SiO₂.—Copyright 1973, Biological Abstracts, Inc.
W74-04123

SEASONAL VARIATIONS OF THE SALINITY IN SOME PROFILES AND IN THE WATER TABLE OF THE SODIC SOILS OF CAMARGUE: PRELIMINARY RESULTS (IN FRENCH),
Institut National de la Recherche Agronomique, Montpellier (France). Service d'Etude des Sols.
For primary bibliographic entry see Field 2G.
W74-04124

APPRECIATION OF THE FITNESS FOR UTILIZATION OF THE SOILS OF PROVENCE,
For primary bibliographic entry see Field 2G.
W74-04125

3D. Conservation In Domestic and Municipal Use

COMMUNITY WELL-BEING AS A FACTOR IN URBAN LAND USE PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6B.
W74-03751

AN EVALUATION OF URBAN FLOOD PLAINS,
For primary bibliographic entry see Field 6F.
W74-03756

INTEGRATING NATURAL RESOURCES INTO AREAWISE AND LOCAL PLANNING: THE SOUTHEASTERN WISCONSIN EXPERIENCE,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 6B.
W74-03965

LEVELS OF ASSESSMENT,
Upper Mississippi River Basin Commission, Twin Cities, Minn.
For primary bibliographic entry see Field 6B.
W74-04035

DEVELOPMENTS IN WATER UTILITY LAW, 1972-1973, AMERICAN BAR ASSOCIATION REVIEW.
For primary bibliographic entry see Field 5G.
W74-04037

3E. Conservation In Industry

THE IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART II. STRUCTURE OF THE INDUSTRY.
Sobtoka (Stephen) and Co., New York.
Available from the National Technical Information Service as PB-207 198, \$4.50 in paper copy, \$1.45 in microfiche. Prepared for Council on Environmental Quality, Washington, D.C., November 1971. 56 p. 16 exhibits.

Descriptors: Costs, *Oil industry, *Pollution abatement, Structure, *Cost analysis, Economic impact, Water quality standards.
Identifiers: *Petroleum refining industry.

Data and background information necessary for the evaluation of the economic impact of the costs of pollution abatement in petroleum refining industry are presented. Analysis of demand indicates four categories of products which would be differently affected by abatement costs: gasoline, intermediates, residual, and other. Anal-

ysis of supply was limited by data availability for large refineries although case study provided some insight on the viability of small refineries. For most firms refining accounted for a smaller portion of their activity compared to marketing. Refinery investment and employment each represent less than 25% of total investment and employment in the domestic oil industry. Considerable variation in age of plant and output capacity was found. Steady growth and a trend toward larger plant size are expected in the future. (See also W73-012708 and W73-01598) (Weaver-Wisconsin)
W74-04076

THE ECONOMIC IMPACT OF POLLUTION CONTROL. AN OVERVIEW, A SUMMARY OF RESEARCH STUDIES.
Chase Econometric Associates, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W74-04077

ECONOMIC IMPACT OF ANTICIPATED PAPER INDUSTRY POLLUTION-ABATEMENT COSTS. PART III. ECONOMIC ANALYSIS.
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W74-04078

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES. COPPER. PART I. INTRODUCTION AND EXECUTIVE SUMMARY.
Charles River Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W74-04081

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES. COPPER. PART II. STRUCTURE OF THE INDUSTRY.
Charles River Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W74-04082

CORROSION AND ITS PREVENTION IN WATERS,
National Chemical Lab., Teddington (England).
For primary bibliographic entry see Field 8G.
W74-04151

THE DIRECT-CYCLE NUCLEAR GAS TURBINE WITH ECONOMICAL DRY AIR COOLING,
Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 5D.
W74-04230

THE ENVIRONMENTAL AND REGULATORY ASPECTS OF THE BREEDER REACTOR,
Atomic Energy Commission Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-04238

3F. Conservation In Agriculture

PRELIMINARY INDICATORS OF INCOME/WEALTH REDISTRIBUTION ASSOCIATED WITH BUREAU OF RECLAMATION PROJECTS,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W74-03771

INCREASING WATER UTILIZATION EFFICIENCY OF A PASTURE GRASS BY INCREAS-

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

ING AFTERMATH THROUGH PLANT SELECTION,

South Dakota State Univ., Brookings. Dept. of Plant Science.

J. G. Ross.

Available from the National Technical Information Service as PB-227 382; \$3.25 in paper copy, \$1.45 in microfiche. South Dakota State University, Water Resources Institute Completion Report, April 1973, 27 p, 9 tab, 4 fig, 5 ref. OWRR A-026-SDAK(1).

Descriptors: *Bromegrass, *Forage grasses, *Plant breeding, *Vegetation regrowth, Genetics, Crop production, Forages, Grasses, Crop yield, *Water utilization, Water conservation, Range grasses, Pastures, Agronomic crops, Feeds, Grasslands, Grazing, *South Dakota.

Optimum water use efficiency of crop plants is necessary to obtain maximum land use. Smooth bromegrass is the best cultivated forage in South Dakota, producing abundant forage in spring and tending to become dormant during the summer. It is suggested that the water use efficiency of this grass could be increased by selecting for a variety with improved regrowth in the summer so that it could continue to provide forage during the entire season. Plants with outstanding regrowth characteristics were selected from two irrigated nurseries. Mean measurements such as yield regrowth, net carbon dioxide exchange and height were significantly different between genotypes. Such measurements usually correlated positively with growth potential. Efficiency of photosynthesis was measured by net carbon dioxide exchange and was unrelated to ability of plants to grow back after cutting. Components of forage yield were closely related to regrowth. A significant environment x genotype interaction occurred which indicates that differences between seasons in production of regrowth occurs. However, some plants were outstanding under both environments. Eight of these were selected for further genetic study. Selection for a synthetic variety with superior regrowth characteristics will be more difficult because of the high interaction of genotype and environment, but the reported results indicate that progress has been made. (Muller-Arizona) W74-03773

ACCUMULATION OF ROOT MASS IN PERENNIAL LEGUME PLOTS ON ERODED SOILS (IN AZERBAIDZHAN),

K. A. Alekperov, and S. G. Guseinov.

Dokl Akad Nauk Az SSR, Vol 27, No 9, p 100-103, 1971, Illus, English summary.

Identifiers: Alfalfa, Eroded soils, Fertility, *Legume plots, Perennial, *Root mass, Sainfoin, Soils, *USSR(Azerbaijan).

Experiments on root accumulation in sainfoin, alfalfa and their mixture were conducted on eroded soil in Azerbaijan. More than 50% of the root mass was accumulated in the upper 0-10 cm of the soil. The perennial legumes produced a greater root mass in the second and third yr than in the first. The general amount of root mass during the experiment exceeded the control (natural vegetation) by 5-6 times. The legumes accumulated a larger root mass from yr to yr, increased soil fertility and build up the granular structure of the soil.—Copyright 1973, Biological Abstracts, Inc. W74-03874

FIELD SHELTERBELT AFFORESTATION AND GREENERY PLANTING,

Vi. V. Bozrikov, F. S. Visloguzov, and G. M. Mordvintsev.

Kainar: Alma-Ata. 1970. 167 p, illus.

Identifiers: *Forestation, Greenery, Meteorological conditions, Pest control, Planting, *Shelterbelts, *Agriculture.

Studies on the following problems are presented: zoning of agricultural amelioration by forestry; agrometeorological and economic effectiveness of field shelterbelts, their planning, spacing, construction and agricultural techniques; trees and shrubs of the shelterbelts and of greenery plantations; the pests and measures for their control; conversion of the existing shelterbelts, and planting in populated rural localities.—Copyright 1973, Biological Abstracts, Inc. W74-03883

NITRATE LEACHING IN SOIL ON RUTGERS AGRICULTURAL RESEARCH CENTER AT ADELPHIA, NEW JERSEY,

Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.

For primary bibliographic entry see Field 5B. W74-03897

HARVEST QUALITIES OF VARIOUS SIZES OF HARD WINTER WHEAT SEEDS UNDER IRRIGATED CONDITIONS IN THE SOUTHERN STEPPES OF THE UKRAINE, (IN RUSSIAN),

A. Ya. Gasanenko, and V. F. Piskun.

Dokl Vses Ord Lenina Akad S-Kh Nauk Im V I Lenina. 12 p, 8-10. 1971. Illus.

Identifiers: *Harvest, Irrigation, Seeds, Sizes, Steppes, *Ukraine, *Wheat seeds, Winter wheat.

The harvest of irrigated hard winter wheat depends largely upon quality of the seeds. Irrigation increases harvest of hard and medium seeds. Seeding with such seeds of hard winter wheat as 'Novomichurinka' increased harvest by 3.0-4.7 c/ha in comparison to soft ones. The harvest increase from hard and medium wheat is noticeable in the first year, in subsequent years this difference levels off.—Copyright 1973, Biological Abstracts, Inc. W74-03915

INVESTIGATION OF THE DYNAMICS OF THE MOISTURE STATE OF THE SOIL UNDER SEVERAL TYPES OF FORAGE CROPS AND UNDER SAINFOIN, (IN CZECH),

Vyzkumny Ustav Rastlinnej Vyroby, Piestanoch (Czechoslovakia).

J. Kosik.

Ved Pr Vysk Ustavu Rastlinnej Vyroby Piestanoch. 9 p, 179-188. 1971. Illus. (English summary).

Identifiers: Bean, Crops, *Forage crops, *Sainfoin, *Soil moisture, Sunflower.

A field trial was made at Piestany on grove-carbonate and clay-loam soil to determine the changes of soil moisture under sainfoin, sunflower and under horse-bean, cultivated for green matter production. Moisture was measured by the weighing method at depths of 5-10, 25-30, 35-40, 45-50, 55-60, and 65-70 cm. The lowest water content was under sainfoin especially during its first and second yr of utilization. The greatest decrease of soil moisture under sainfoin was observed in May-June. The soil moisture under sainfoin decreased approximately in a linear manner with depth. The highest content of soil moisture was under horsebean, which dried the soil markedly only to a depth of 20 cm. Sunflower, however, removed the soil humidity also from greater depths and lowered the humidity in the whole investigated profile of the soil.—Copyright 1973, Biological Abstracts, Inc. W74-03917

WATER PRODUCTION FUNCTIONS AND IRRIGATION PROGRAMMING FOR GREATER ECONOMY IN PROJECT AND IRRIGATION SYSTEM DESIGN AND FOR INCREASED EFFICIENCY IN WATER USE,

California Univ., Riverside. Dept. of Water Science and Engineering.

J. I. Stewart, R. M. Hagan, W. O. Pruitt, and W. Hall.

Availability from NTIS as PB-219 609 \$6.00 in paper copy, \$1.45 in microfiche. Final report to the Bureau of Reclamation, March 1973. 165 p, 31 fig, 19 tab, 84 ref. 14-06-D-7329.

Descriptors: *Irrigation practices, *Irrigation systems, *Irrigation efficiencies, *California, Crop response, Surface irrigation, Irrigation operation and maintenance, Water distribution(Applied), Water utilization, Water requirements, Evapotranspiration, Optimization, Corn(Field), Sorghum, On-site investigations, *Water utilization.

Identifiers: *Water production functions.

Results are presented of a continuing long-term study attempting to make quantitative predictions of the relationships between yields of principal crops and water. Results of four years of field experiments on corn are included with two years of similar data for sorghum, along with conceptualization and detailed methodology of a comprehensive approach to planning the use of water in agriculture. The method combines researched genetic characteristics of crops with planned irrigation site measurements of climate, soil and irrigation capabilities to estimate four quantitative parameters. These are: generalized relative value functional relations between yield and evapotranspiration of given crop varieties, generalized absolute value yield versus evapotranspiration functions for a given crop varieties in measured evaporative conditions, absolute value yield versus irrigation functions for given crop varieties in measured conditions of climate, soil, and irrigation capacity; and optimal programs of dates and depths of irrigation suited to give crop varieties in measured environments. (Muller-Arizona) W74-03920

A RESISTANCE MODEL TO PREDICT EVAPOTRANSPIRATION AND ITS APPLICATION TO A SUGAR BEET FIELD,

Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.

For primary bibliographic entry see Field 2D. W74-03921

WEST SIDE CROP ADAPTABILITY STUDY.

California State Dept. of Water Resources, Sacramento.

Available from Office of Procurement, Documents Section, P.O. Box 20191, Sacramento, Calif. 95820 for \$3.00 per copy. Bulletin No 163, March 1970, 83 p, 6 fig, 16 tab, 5 ref.

Descriptors: *Irrigable lands, *Air temperature, *Crop response, *Climatic data, Irrigation, Arid lands, *California, Citrus fruits, Vine crops, Soil types, Saline soils, Salinity, Boron, Windbreaks, Environmental effects.

Identifiers: *San Joaquin Valley.

Data accumulated on a 625,000-acre block of undeveloped irrigable land along the south-western and southern edges of the San Joaquin Valley over a five-year period from 82 climatological stations indicate that large areas apparently are adaptable to citrus and vineyard cultivation, although heating and wind protection will be required for citrus, and wind protection may be desirable for vineyards. The entire area is climatically suited for some deciduous fruits and nuts, and vegetable and field crops may be grown if planting times are adjusted to meet the indicated temperature conditions. Since wind will present some hazard to most crops in much of the area, use of wind breaks is indicated. Soils are mostly deep and fertile in the 80 per cent of the study area having flat or very gentle slopes. Although salinity and/or boron problems occur on about 40 percent of the land, approximately only 15 percent pose any serious problems, where leaching and drainage will be required. The

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

20 percent of the area having gentle-to-moderate slopes is characterized by soils of more variable depth unaffected by soil salinity or boron. Tabulations of soil and climatic data and generalized maps of soil salinity and boron are included. (Muller-Arizona)
W74-03922

ARIZONA INDIAN CORN (ZEA MAYS L.).
Arizona Univ., Tucson.
A. D. Day, D. R. Grove, and R. K. Thompson.
Journal of the Arizona Academy of Science, Vol 7, No 1, p 8-11, February 1972. 3 tab, 7 ref.

Descriptors: *Corn(Field), *Plant breeding, *Crop response, *Plant physiology, Agronomy, Crop production, Resistance, Drought tolerance, Drought resistance, Cereal crops, Grains(Crops), Field crops, Environmental effects, *Southwest U.S., Arizona.
Identifiers: *Indian Corn.

Corn has been cultivated for centuries throughout the Americas by various Indian tribes. During its propagation in the area it has adapted to many environmental conditions, the greatest occurring in the semi-arid regions of the southwestern United States. The Hopi and Papago Indians of that region have cultivated corn for hundreds of years and have developed into superior dry-land farmers. The corn which they have cultivated has been overlooked by many plant breeders developing corn for semi-arid regions throughout the world. This study compares 20 representative corn selections of this type in terms of desirable breeding characteristics. Indian flour and dent selections, and selections from the white dent Mexican June Complex were included. Significant differences in height, leaf length, leaf width, nodes per stalk, plants per plot, stalks per plot, soluble solids in stalk juice, forage yield, grain yield, grain volume-weight, and maturity were noted. Indian corn was earlier, had longer leaves, more stalks per plot, and higher grain volume-weights than selections from Mexican June Complex. (Muller-Arizona)
W74-03926

THE ECONOMICS OF SHORT-SEASON COTTON PRODUCTION IN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
G. S. Willett, B. B. Taylor, and D. R. Buxton.
Progressive Agriculture in Arizona, Vol 25, No 5, p 3-5, 15, September-October 1973. 4 tab, 9 ref.

Descriptors: *Cotton, *Crop production, *Cost comparison, *Water costs, *Planting management, *Arizona, Insecticides, *Seasonal.
Identifiers: Growing season.

A number of factors favoring a short-term cotton-growing season in Arizona emerge from studies made of a conventional planting of 30,000 plants per acre to determine the relationship between various irrigation and crop termination dates and per acre profitability. Improved lint quality, earnings from earlier sales, better management of crops following the cotton season, and reduced costs are detailed. Since damage to the crop by the pink bollworm tends to be concentrated over the latter part of the growing season, the shorter season enables producers to avoid some insecticide costs. Fewer irrigations are required, resulting in lower water costs, as well as reduced power and labor requirements. Reductions in fertilizer costs are an additional plus factor, which combined with other savings offset yield losses resulting from the shorter season. Tables show that producers using cheaper Colorado River water can afford to lose about 9 percent of their full-season yield through a month shortening of the growing season and still break even; this compares to approximately 12 percent for those pumping water from 700 foot underground. The study develops guidelines based on these factors. (Paylore-Arizona)

W74-03928

ALFALFA QUALITY: IS THERE A DIFFERENCE,
Arizona Univ., Tucson.
T. J. Vorachek, A. K. Dobrenz, B. Theurer, and W. H. Hale.
Progressive Agriculture in Arizona, Vol 25, No 5, p 12-15, September-October 1973. 4 fig, 2 tab, 3 ref.

Descriptors: *Alfalfa, *Forage legumes, *Water utilization, *Irrigation practices, *Seasonal, Arizona, Crop response, Forage palatability, Field crops, Taste.

The study was designed to determine to what extent varietal and seasonal factors influence total dry matter and digestible dry matter production, to aid in decisions on frequency and date of irrigation. Measurements were made on three year old experimental plots of Mesa-Sirsa, El-Unico, Sonora, and Moapa alfalfa. These cultivars differed under controlled conditions of irrigation and moving in the apparent digestible dry matter and forage produced, with Mesa-Sirsa being the most productive, Sonora and Moapa least. The Mesa-Sirsa was also the most efficient cultivar in water-use. The study supports the practice of withholding water from alfalfa during July and August when the crop tends to slump in production. The observations of this study should be of interest to the alfalfa grower since the water requirement of a forage crop in the arid southwest is important both economically and from the viewpoint of availability. Since differences in digestibility among the four cultivars were insignificant, producers should select those giving the best dry forage yield for the most efficient use of water required, in order to obtain maximum production. All experiments seem to point to Mesa-Sirsa as being the best of the four used. (Paylore-Arizona)
W74-03930

THE EFFECT OF DROUGHT ON THE COTTON WATER REGIMEN AT DIFFERENT STAGES OF ITS DEVELOPMENT, (IN RUSSIAN),
K. Mirzambetov.

Ekologiya, Vol 3, No 4, p 103-105, 1972.
Identifiers: *Cotton, Development, *Drought effects, Water regimen, *Cultivars.

Two cultivars 'S-4727' and 'Chimbai-6' were used in 80% (full capacity of the soil), and 60% and 40% experimental moisture studies during various periods of development. Cotton was most sensitive to lack of moisture during its flowering phase. 'Chimbai-6' cotton adapted better to dry conditions.—Copyright 1973, Biological Abstracts, Inc.
W74-03942

WEED CONTROL IN SUGAR BEET CROPS IN THE KOSOVO REGION, (IN SERBO-CROATIAN),

Agricultural Inst., Pristina (Yugoslavia).
P. Zekovic.

Agrohemija, 3/4, p 123-129, 1972.

Identifiers: Crops, *Herbicides, Phenyl-4-Amino-5-Chloro, Pyridazone, *Weed control, *Sugar beets, *Yugoslavia(Kosovo region).

The efficiency of Pyramin (1-phenyl-4-amino-5-chloro-pyridazon) in the control of weeds in sugar beet crops under conditions of irrigation by sprinkling, conventional irrigation and dry farming, with the use of different amounts of NPK fertilizers was tested. The amount of the herbicide used was 5 kg/400 l water/ha. Weediness decreased in experimental areas, accompanied by an increase in yield per unit area and in sugar percentage in the root.—Copyright 1973, Biological Abstracts, Inc.
W74-03943

EFFECT OF MOISTURE STRESS UPON MAIZE PRODUCTION AND ITS ECONOMIC SIGNIFICANCE,
Natal Univ., Pietermaritzburg (South Africa).
Dept. Pasture Science and Agrometeorology.
J. M. Delager, and J. B. Mallet.
S Afr J Sci, Vol 68, No 7, p 182-186, 1972. Illus.
Identifiers: Economics, *Mathematical models, *Moisture stress, *Corn(Field), Crop production.

A mathematical model is established for determining the time of occurrence and number of days of moisture stress experienced by a maize crop during growth season. As input data the model requires values of daily evaporation and rainfall and is applicable to Doveton series soils 1.2 m in depth. Field capacity of each of 4 soil layers must be known and the manipulations account for variations in root distribution with crop development. The model was computerized and applied to data from 3 farming regions in Natal. Expected average gross margins for each area were calculated. Utilizing a figure describing the decrease in final year per unit stress day experienced, it was possible to determine the probability of occurrence of maize yields between selected limits.—Copyright 1973, Biological Abstracts, Inc.
W74-03948

SOME DATA ON THE WATER ECONOMY AND THE UTILIZATION OF WATER RESOURCES IN BULGARIA, INCLUDING IRRIGATION,
Bulgarian National Committee on Irrigation and Drainage, Sofia. Water Development Design Inst. P. I. Munkov.
Irrigation and Power, Vol 28, No 4, p 99-105, 1972. 1 fig, 3 tab.

Descriptors: Hydrologic data, *Regional analysis, *Irrigation practices, *Water demand, Water distribution(Applied), Europe, *Water utilization.
Identifiers: *Bulgaria.

Physiographical, climatic, and hydrologic data for Bulgaria gives insight into the development of irrigation, water gauging stations, and multipurpose planning within the country. Bulgaria is a mountainous country, with lowlands and hilly regions composing only 20% of its total land area. Difficulties with limited water resources have been accentuated by growing demands for water; demands have increased over 88% in the 1965-70 period. These difficulties have made it important for the country to develop both a large water gauging network and multipurpose plan to accommodate alternative water users. Information gleaned from gauging stations has been instrumental in the formulation of plans for regulating annual and perennial runoff, permitting transfers of water between basins and utilizing water from the Danube and ground water. Irrigation water is an important element in increasing Bulgaria's agricultural productivity. The basic problem confronting agricultural planners is the shortage of agricultural labor and the need to transform the existing gravity irrigation systems into automatic systems. (Schroeder-Wisconsin)
W74-03954

WATER RENOVATION FOR UNRESTRICTED RE-USE,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-04034

OPTIMUM FORAGE PRODUCTION AND THE ECONOMIC ALTERNATIVES ASSOCIATED WITH GRAZING IRRIGATED WHEAT, TEXAS HIGH PLAINS,

Texas Agricultural Experiment Station, Bushland. J. Shipley, and C. Regier.
Texas Agricultural Experiment Station Publication No 1968, p 3-11, December 1972. 4 fig, 9 tab, 1 ref.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

Descriptors: *Crop production, *Irrigation efficiency, Economic efficiency, Grazing, *Wheat, *Forages, Productivity, Costs, Texas, Net income, Cattle, *Optimum development plans, Alternative costs.

Identifiers: *Texas High Plains, Opportunity cost analysis.

Irrigated winter wheat grown in the Texas High Plains is often grazed during the fall and winter. However, in early spring grazing may continue leading to a grazed-out pasture or animals may be removed from the pastures and higher risk grain production commenced. To establish guidelines for optimum water management and winter wheat grazing practices in the production of wheat, studies were conducted on a silty clay loam during a three-year period, 1969-1972. Forage and grain yield response to various fall irrigation treatments, seeding rates and lengths of grazing periods were determined. Optimal forage was produced with a 90-pound seeding rate and two fall irrigations. Average grain yields from similar seeding ranged from 49.8 to 21.8 bushels per acre when grazing was terminated March 20 and May 1, respectively. Average daily gain of cattle from November to May was 1.8 pounds based on a fall stocking rate of 1.5 400-pound animals per acre. Given current market conditions, an economic incentive was found for grazing irrigated wheat through March 20. (Weaver-Wisconsin)
W74-04086

DROUGHT-AFFECTED MITOCHONDRIAL PROCESSES AS RELATED TO TISSUE AND WHOLE PLANT RESPONSES,
Illinois Univ., Urbana, Dept. of Agronomy.
D. E. Koeppel, R. J. Miller, and D. T. Bell.
Agronomy Journal, Vol 65, p 566-569, July-August 1973. 6 fig, 1 tab, 25 ref.

Descriptors: *Plant tissue, *Moisture stress, *Plant physiology, *Membranes, Seeds, Respiration, Metabolism, Plant morphology, Transpiration, Stomata, Drought, Corn(Field).

Identifiers: *Mitochondria.

The purpose was to correlate the respiration rates of whole seedlings, excised shoots, and isolated mitochondria of Zea mays under various degrees of water stress. The oxidation rate of substrate by mitochondria isolated from water-stressed tissue decreased with increasing stress. A similar decrease in respiration rate was observed with whole shoots and excised seedlings. Seedling water content corresponded to respiration in behavior. Upon release from water stress, seedlings rapidly returned to the prestress water potential level. Mitochondrial processes were observed to be altered by water stress and these alterations were found to persist even when the mitochondria were isolated from the growing tissue. The observed decrease in the rate of whole plant respiration with increased stress may be due to membrane alterations that effect the ability of mitochondria to oxidize substrate. Comparisons of the whole plant, tissue, and cellular level responses to drought stress indicate the site of these functional alterations to be associated with the membranes of mitochondria. (Muller-Arizona)
W74-04127

DRY LAND RESEARCH IN NORTHWEST INDIA. I: EFFECT OF VARIABLE PRE-PLANTING TILLAGE ON SOIL MOISTURE, GROWTH, AND YIELD OF PEARL MILLET (PENNISETUM TYPHOIDES, S. AND H),
Haryana Agricultural Univ., Hissar (India). Dept. of Agronomy.
A. S. Malik, V. Kumar, and M. K. Moolani.
Agronomy Journal, Vol 65, p 12-14, January-February 1973. 1 fig, 2 tab, 17 ref.

Descriptors: *Soil moisture, *Cultivation, *Dry farming, *Infiltration, Retention, Storage capacity, Moisture availability, Percolation, Irrigation effects, Cereal crops, Crop response.

Identifiers: *India.

Four preplanting tillage methods (turn plowing, chiseling, double disk and no tillage) were tried on pearl millet under dry land conditions. The highest infiltration rate and lowest bulk density values were found to occur with turn plowing. This method thus had the greatest soil moisture profile throughout the growing season of the crop. Maximum soil moisture variation was observed in the 60 to 90 cm layer below the surface. Grain yield from turn-plowed plots was approximately 29 percent higher than that from plots of no tillage. Weed yield on the nontilled plots was found to be almost twice that on the tilled plot while root growth was comparatively poor. Most of the plant and soil observations showed little difference between turn plowing and chiseling, while double disk was very similar to no tillage. (Muller-Arizona)
W74-04128

THE ESTIMATION OF NET RADIATION AND POTENTIAL EVAPOTRANSPIRATION USING ATMOMETER MEASUREMENTS.

Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.

For primary bibliographic entry see Field 2D.
W74-04129

CULVERTS FOR FLOW MEASUREMENT IN IRRIGATION SYSTEMS,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 4A.
W74-04131

LEAF ORIENTATION OF A COTTON PLANT,

Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.

A. R. G. Lang.
Agricultural Meteorology, Vol 11, p 37-51, 1973. 12 fig, 4 tab, 18 ref.

Descriptors: *Cotton, *Leaves, *Radiation, Plant tissues, Measurement, Fiber crops, Field crops, Plant physiology, Photoperiodism, Evaporation, Distribution patterns, Irrigation.

Cotton is a commonly cultivated crop under irrigation in arid and semi-arid regions. The evaluation of the irrigation requirements for such a crop is a function of the net incident radiation to the evaporative surface of the plants, among other considerations. An understanding of the orientation of the cotton leaves aids in the estimation of this radiation. Leaf area distribution as a function of the elevation angle and azimuth are frequently thought to be random. The actual distributions for two varieties of cotton plants are reported from observations of the complete spatial coordinates of the leaves using a new apparatus. Leaves were found to have a preferential orientation toward the east during the morning and to turn with the sun and to disperse in orientation as the day proceeds. Leaf orientation distributions are given in terms of the angle between the incident solar radiation and the normal to the leaf surface, both for sunlit leaves only and for total leaves. These and similar analyses should allow an adequate understanding of problems which depend upon the geometrical location of leaves. (Muller-Arizona)
W74-04132

USE OF SPRINKLERS TO STUDY THE INFLUENCE OF POPULATION DENSITY UPON SEED COTTON PRODUCTION IN AN ARID AREA,

California Univ., Davis. Dept. of Water Science and Engineering.

F. E. Robinson, and D. Cudney.
Agronomy Journal, Vol 65, p 266-268, March-April 1973. 4 tab, 12 ref.

Descriptors: *Cotton, *Sprinkler irrigation, *Irrigation effects, *Arid lands, Plant growth, Plant population, Planting management, Seeds, *California.

Identifiers: *Imperial Valley(Calif).

The cotton growth period has been reduced by two months in the arid Imperial Valley because of the invasion of pink bollworm. Cotton residue must now be incorporated into the soil to lower the number of overwintering larvae. The reduced time of floral development led to the examination of yield potential under various plant spacing configurations. Defoliants, fertilizers, desiccants, and insecticides for pink bollworm control and water were applied through a sprinkler system. Randomized block design of Stoneville 213 and Paymaster 111A varieties included plant densities ranging from 15,000, 60,000, 242,000, and 969,000 plants/ha on a flat soil surface. Planting was accomplished by hand at 2 per dibble in a square grid pattern. Bolls per plant were found to increase with planting density while the effect of plant density on boll weight was significant on Paymaster 111A but no on the Stoneville 213. The highest seed cotton yield occurred where the plants produced the greatest number of bolls per unit area. A tendency of lower micronaire in the highest density was noted in each variety. (Muller-Arizona)
W74-04133

SELECTING A METHOD FOR SCHEDULING IRRIGATION, USING A SIMULATION MODEL.

Illinois Univ., Urbana. Dept. of Agricultural Engineering.

W. D. Lemke, and B. A. Jones, Jr.

Transactions of the ASAE (American Society of Agricultural Engineers), p 284-286, 1972. 5 fig, 6 ref, 1 tab.

Descriptors: *Scheduling, *Soil moisture, *Rates of application, *Irrigation practices, Model studies, Corn(Field), Arid lands, Arid climates, Water balance, Irrigation progress, Soils, Field capacity, Soil management, *Simulation analysis, *Illinois.

Three irrigation scheduling practices on two soils were compared in a water balance model simulation. The practice of applying 30 percent of the available water when the soil moisture drops to the 70 percent level was the most profitable for soils with a water holding capacity of 0.8 inches per foot. The alternate practice of treating a soil at 60 percent with 40 percent of the available water was found to be uneconomical. A procedure of applying one inch of net water after any 7-day period during which less than an inch of rain falls was found satisfactory for a soil with a water holding capacity of 1.2 inches per foot. While the experiment was based on an Illinois campfield, the model simulation is applicable to any irrigated agriculture area. (Muller-Arizona)
W74-04134

SURFACE WATER STORAGE CAPACITY OF SELECTED CROP LEAVES UNDER IRRIGATION SPRAYS,

Kentucky Univ., Lexington. Dept. of Agricultural Engineering.

B. J. Barfield, F. A. Payne, and J. N. Walker.
Agricultural Meteorology, Vol 12, p 105-111, 1973. 2 fig, 4 tab, 9 ref.

Descriptors: *Vegetable crops, *Plant tissues, *Leaves, *Soil-water-plant relationships, *Sprinkler irrigation, *Irrigation effects, Moisture, Water spreading, Water distribution(Applied), Moisture content, Moisture uptake.

Lettuce, cucumber, and tomato plants were analyzed for surface water storage capacity at various sizes of spray irrigation drops, stem angles, and leaf temperature. Stem angle and leaf temperature were found not to have an influence on storage capacity while spray drop size signifi-

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

cantly affected storage. Lettuce was found to have the highest surface water storage capacity of 0.20 mm and cucumbers were found to have the least, at 0.11 mm. Tomatoes were found to have a capacity of 0.18 mm. These findings indicate that the use of small drop sizes or fine mist in spray irrigation will maximize the amount of water retained by the leaves of the plant. (Muller-Arizona)

W74-04135

ABSCISSION PROCESSES IN COTTON: INDUCTION BY PLANT WATER DEFICIT,

Texas A and M Univ., College Station. Dept. of Plant Sciences.

B. L. McMichael, W. R. Jordan, and R. D. Powell. *Agronomy Journal*, Vol 65, p 202-204, March-April 1973. 4 fig, 15 ref.

Descriptors: *Cotton, *Moisture deficit, *Moisture tension, Leaves, Fiber crops, Plant physiology, *Soil-water-plant relationships.

Identifiers: *Abscission.

Although the shedding of cotton bolls is characteristic of this plant, the extent of such shedding is quite variable. This study examines the effect of water stress on boll and leaf abscission. Plant water deficits were induced by withholding water, and leaf water potential was measured with a pressure bomb device. A linear increase in abscission was noted with the decrease of leaf water potential from -10 to -24 bars. Older leaves were shed in response to lower water stress than were juvenile leaves. Immature bolls were sensitive to water stress while bolls remaining on the plant for 14 days were retained even under severe water stress. A predawn leaf water potential of approximately -8 bars was necessary to induce significant leaf abscission. (Muller-Arizona)

W74-04136

GRAIN SORGHUM RESPONSE TO TRICKLE AND SUBSURFACE IRRIGATION,

Texas A and M Univ., College Station. Dept. of Agricultural Engineering.

E. A. Hiler, and T. A. Howell.

Transactions of the ASAE (American Society of Agricultural Engineers), p 799-803, 1973. 5 fig, 3 tab, 18 ref.

Descriptors: *Irrigation efficiency, *Grain sorghum, *Subsurface irrigation, Irrigation water, Irrigation practices, Irrigation systems, Water utilization, Soil-water-plant relationships, Crops, Grains(Crops).

Identifiers: *Trickle irrigation.

Water use efficiencies are compared in a controlled-water experiment using intensified and conventional irrigation methods. The influence of reduction irrigation amounts on crop yields is evaluated for trickle irrigation. Trickle and mist irrigation resulted in highest water use efficiency of the methods tested. The intensified treatments were found to produce greater crop height and leaf area in grain sorghum crops. The water use efficiency of trickle irrigation methods was maximized by using small amounts of applied water. These results show that irrigation by trickle and subsurface techniques offer water use efficiencies compatible with arid land applications of these methods. (Muller-Arizona)

W74-04137

SEMI-PORTABLE SHEET METAL FLUME FOR AUTOMATED IRRIGATION,

Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.

V. W. Uhl, Jr. and J. E. Garton.

Transactions of the ASAE (American Society of Agricultural Engineers), p 256-260, 1972. 7 fig, 7 ref.

Descriptors: *Irrigation systems, *Irrigation practices, *Irrigation engineering, *Flowmeters, *Flumes, Conveyance structures, Engineering structures, Hydraulic structures, Open channels, Water measurement.

A flume of sheet metal for automated cut-back irrigation is hydraulically and structurally designed. The optimum design determined is tested. Design considerations were ease of assembly in the field, support of the channel in the field, and leakage. Manning's and relative roughness coefficients were determined experimentally. The final design obtained had a hydraulic cross-section compatible with practical use and construction. The structural frame of angular steel was found satisfactory. Orifice and weir calibration curves obtained compared favorably with published data. Bay construction was tested and compared to published information, and was found acceptable. In general, the sheet metal flume was found compatible with low cost construction and usage in irrigation projects such as those necessary for arid lands agriculture. (Muller-Arizona)

W74-04138

MOVEMENT OF NITRATES UNDER IRRIGATED AGRICULTURE,

Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.

For primary bibliographic entry see Field 5B.

W74-04139

EFFECT OF IRRIGATION FREQUENCY ON THE AVERAGE EVAPOTRANSPIRATION FOR VARIOUS CROP-CLIMATE-SOIL SYSTEMS,

Universidad Católica de Chile, Santiago. Departamento de Edafología.

A. L. Norero, J. Keller, and G. L. Ashcroft.

Transactions of the ASAE (American Society of Agricultural Engineers), p 662-666, 1972. 6 fig, 1 tab, 23 ref.

Descriptors: *Evapotranspiration, *Soil moisture, *Corn(Field), *Alfalfa, *Soil-water-plant relationships, Soil environment, Irrigation effects, Irrigation practices, Soils, Model studies, Mathematical models, Evaporation, Transpiration, Root zone.

Soil-plant-atmosphere form a single continuous system for the movement of water. The evaporation of water from plants is the result of interactions of all three components of the system, and cannot be characterized by any single one. To create conditions for better decisions in plant-water situations, working mathematical models can play an important role. In this investigation, two field crops, corn and alfalfa, were selected to study the effect of irrigation frequency on evapotranspiration, with the former evaluated by the influence of atmospheric evaporative demands on evapotranspiration with plants grown in 24 in. deep 20-gallon field lysimeters; the latter by establishing evapotranspiration of an established field crop of alfalfa, with an extensive 9 ft. deep root system, as a function of soil moisture potential. These experiments demonstrated rather extreme cases in terms of the irrigation frequency required to maintain a high evapotranspiration rate or relative productivity. It concludes that it is possible to take crop data obtained from a few field experiments and extend them to other climatic zones and/or field sites. It is also possible to group crops with similar leaf-root development relationships and draw inferences for a whole crop group from experiments conducted on only one crop within the group. (Muller-Arizona)

W74-04140

UPTAKE AND TRANSLOCATION OF SR BY ZEA MAYS,

California Univ., Berkeley. Dept. of Soils and Plant Nutrition.

For primary bibliographic entry see Field 5C.

W74-04147

DROUGHT RESISTANCE OF PEAR VARIETIES OF THE MAIN ECOLOGICAL-GEOGRAPHIC GROUPS, (IN RUSSIAN),
Vsesoyuznyi Institut Rastenievodstva, Leningrad (USSR).

A. G. Pruss.

Dokl Akad S-Kh Nauk. 11. p 14-15. 1972.

Identifiers: *Drought resistance, Ecological studies, *Pear varieties, *USSR, Arid lands, Semi-arid lands.

The classification of more than 100 pear varieties according to degree of drought resistance makes possible a more rational introduction of varieties for purposes of increasing productivity in arid and semiarid regions of the USSR.—Copyright 1973, Biological Abstracts, Inc.

W74-04220

MICROFLORA OF NUTRIENT SOLUTION IN SOILLESS GROWING OF VEGETABLE CROPS, (IN RUSSIAN),

Institut Fiziki, Krasnoyarsk (USSR).

L. S. Tirranen, and M. S. Rerberg.

Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk. 3 p 68-72. 1972. (English summary).

Identifiers: Bacterium, Chromobacterium, Flora, Growing, Microflora, Mycobacterium, Nutrients, *Pseudomonas, Soilless growing, *Vegetable crops, *Microorganisms.

The microflora consisted mainly of Pseudomonas, Bacterium, Mycobacterium and Chromobacterium. Pseudomonas was predominant. The number of microorganisms increased with time.—Copyright 1973, Biological Abstracts, Inc.

W74-04235

EFFECT OF WEATHER CONDITIONS ON SPORULATION OF HELMINTHOSPORIUM TURCICUM PASS,

Z. A. Volkvadze.

Mikol Fitopatol. Vol 6, No 6, p 536-537. 1972.

Identifiers: Air temperature, *Corn(Field), *Helminthosporium-turicum, Humidity, *Sporulation, Weather conditions, Dew, *Fungi.

Experiments on corn demonstrated that the time during which dew remains on plants determines the rate of sporulation of *H. turicum*. This process is accelerated with an increase of air temperature and humidity.—Copyright 1973, Biological Abstracts, Inc.

W74-04296

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE OPTIMAL EXPANSION OF A WATER RESOURCES SYSTEMS,

Texas Univ., Austin. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 6A.

W74-03754

AN EVALUATION OF URBAN FLOOD PLAINS,

For primary bibliographic entry see Field 6F.

W74-03756

ALASKA WATER RESOURCES RESEARCH NEEDS FOR THE 70'S.

Alaska Univ., College. Inst. of Water Resources.

For primary bibliographic entry see Field 6B.

W74-03757

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

ILLINOIS STORM SEWER SYSTEM SIMULATION MODEL: USER'S MANUAL,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-03763

WATER RESOURCES NEWSLETTER, JUNE 1973.

Australian Water Resources Council, Canberra.
Water Resources Newsletter (Australia Government Publishing Service, Canberra, No 20, June 1973. 120 p.

Descriptors: *Water resources, *Australia, *Projects, *Publications, *Reviews, Environmental control, Sedimentation, Data collections, Water quality control, Watershed management, Surface waters, Groundwater resources, Hydrogeology, Model studies, Hydrology, Hydrologic data, Flood control, Water supply, Water demand, Conferences.

The Water Resources Newsletter, issued twice a year in June and December, is authorized by the Australian Water Resources Council (AWRC). It is compiled from information received from AWRC organizations and other sources by the AWRC Secretariat, Water and Soil Resources Division, Department of the Environment and Conservation, Canberra. Data and information are presented under the following main topics: water management and development; water quality management; sedimentation; groundwater studies; hydrology; meetings, symposia, conferences, courses; films and publications; personal news; and functions of council and its committees. AWRC and other publications are listed. (Woodard-USGS)
W74-03774

UPSLOPE EROSION ANALYSIS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W74-03799

FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON, PART 2,

Geological Survey, Portland, Oreg.

E. A. Oster.

Open-file report, 1973. 113 p, 85 fig, 8 tab, 3 ref.

Descriptors: *Flood profiles, *Flood frequency, *Flood data, *Land development, *Oregon, Flood plains, Flood plain zoning, Hydrologic data, Gaging stations, Streamflow, Flood peak, Low flow, Correlation analysis, Flow characteristics, Backwater, Reviews, Data collections, Evaluation, Watershed management, Flood forecasting. Identifiers: *Umpqua River basin(Oreg).

Flood elevations for the selected reaches of the Umpqua River basin, Oregon, are presented in graphic and tabular form. To give a concept of range in stage, a low-water profile is included. The profiles presented are in reasonably good agreement with documented high-water marks and stage-discharge relations defined by current meter. This study was made at the request of Douglas County to develop profiles for the 10-, 25-, 100-, and 500-year floods and the December 1964 flood. This report is the second of three reports that will cover approximately 300 miles of Umpqua River basin streams. The reaches covered by this report are: Umpqua River from Scottsburg upstream to Hubbard Creek, and North Umpqua River from Winchester Dam upstream to Idleyld Park. (Woodard-USGS)
W74-03803

FLOODS IN IOWA: TECHNICAL MANUAL FOR ESTIMATING THEIR MAGNITUDE AND FREQUENCY,

Geological Survey, Iowa City, Iowa.

O. G. Lara.
Iowa Natural Resources Council Bulletin No 11, March 1973. 56 p, 20 fig, 8 tab, 16 ref, append.

Descriptors: *Flood frequency, *Flood forecasting, *Iowa, Streams, Methodology, Regression analysis, Hydrologic data, Equations, Topography, Flood peak, Mathematical models, River basins, Physical properties.
Identifiers: Unregulated natural streams.

Techniques and procedures for estimating the probable magnitude and frequency of floods on Iowa streams include instructions, equations, and graphs in a concise form. The estimating equations are based on regional relations between floods of specific return periods and selected basin characteristics. The size of the drainage area and the slope of the stream channel are the most important factors that influence flood peaks in Iowa. It was necessary to subdivide the State into two hydrologic regions. Region I covers about 68% of the land surface of Iowa, and Region II covers most of that area described by Ruhe, (1969), as the Des Moines lobe. Within each region, regression equations have been developed which relate peak discharges of 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals to basin characteristics. The range in drainage area size varied from 0.33 to 14,038 square miles, and the slope from 1.31 to 100 feet per mile. The flood formulas were derived from data for unregulated natural streams. Therefore, they are not applicable to streams draining urban areas or basins affected by manmade controls. (Woodard-USGS)
W74-03805

WATER RESOURCES OF THE NORTHERN CHEYENNE INDIAN RESERVATION AND ADJACENT AREA, SOUTHEASTERN MONTANA,

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 7C.
W74-03809

FLOODS OF THE 1970 AND 1971 WATER YEARS IN MISSISSIPPI,

Geological Survey, Jackson, Miss.

For primary bibliographic entry see Field 2E.
W74-03816

DEWATERING OF THE CLAYTON FORMATION DURING CONSTRUCTION OF THE WALTER F. GEORGE LOCK AND DAM, FORT GAINES, CLAY COUNTY, GEORGIA,

Geological Survey, Atlanta, Ga.

For primary bibliographic entry see Field 4B.
W74-03819

STATEMENT OF PROGRESS ON INVESTIGATION AND ANALYSIS OF FLOOD HYDROGRAPHS FROM SMALL DRAINAGE BASINS IN SOUTH DAKOTA,

Geological Survey, Huron, S. Dak.

L. D. Becker.

Open-file report, November 1973. 20 p, 1 fig, 4 ref.

Descriptors: *Flood frequency, *Flood forecasting, *South Dakota, Road construction, Culverts, Highways, Design criteria, Hydrologic data, Streamflow, Flood peak, Topography, Physical properties, Data collections, Project purposes, Planning, Reviews, Evaluation.

A research study was initiated in 1967 to obtain information on the shape of flood hydrographs, climatic factors, and physiographic conditions affecting floods in South Dakota. The design of highway structures requires a knowledge of the magnitude and frequency of peak discharges expected at a given site. Information concerning the characteristic shape of flood hydrographs is also necessary if storage is to be considered as a factor in the design of culverts in highway embankments. Progress is summarized for the first 6.25 years of

the 10.5-year research study. An extensive data collection network has been designed, instrumented, and is being operated. Concurrent records of precipitation and streamflow are being obtained for use in a rainfall-runoff model. Data being collected are considered both suitable and adequate for project needs. (Woodard-USGS)
W74-03821

AUTOMATIC CONTROL OF LEVEL, PRESSURE, AND FLOW,
Cla-Val Co., Newport Beach, Calif. Commercial Sales Div.
For primary bibliographic entry see Field 8C.
W74-03861

FIELD SHELTERBELT AFFORESTATION AND GREENERY PLANTING,

For primary bibliographic entry see Field 3F.
W74-03883

SYSTEMS SIMULATION OF ECONOMIC FACTORS AND THEIR RELATION TO THE WATER SYSTEM OF WYOMING'S PLATTE RIVER BASIN,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6A.
W74-03892

SEQUENTIAL STOCHASTIC OPTIMIZATION FOR RESERVOIR SYSTEM,

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

T. E. Croley, II.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Proceedings paper No 10263, p 201-219, January 1974. 5 fig, 7 tab, 22 ref. NSF GK-11564.

Descriptors: *Reservoir operation, Water resources, Hydraulics, *Stochastic processes, *Optimization, *Dynamic programming, Costs, Simulation analysis, Monte Carlo method, Statistical methods, Methodology, Mathematical models, Systems analysis, *Alternative water use.
Identifiers: Computation, Reduction, Data acquisition.

Considered is the practical application of stochastic optimization techniques to problems of finding optimum operations sequentially for reservoir systems. There is need for a sequential technique which surmounts the difficulties associated with present-day stochastic optimization methods. Existing techniques are reviewed, associated problems identified, and an alternative sequential which overcomes these problems is suggested; this alternative is then illustrated and compared to existing techniques using a hypothetical example. Feasible use of the alternate is possible since observations on planning horizons are employed in computation reduction. For a simple reservoir system, the techniques are applied and compared. Results show that computation costs were reduced and system performance was improved with the use of the alternate. (Bell-Cornell)
W74-03914

PYRAMID LAKE RECREATION DEVELOPMENT PLAN, INITIAL FACILITIES,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6B.
W74-03955

LOS BANOS RESERVOIR RECREATION DEVELOPMENT PLAN,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6B.
W74-03956

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Groundwater Management—Group 4B

A BILL TO AUTHORIZE EXTENSIONS OF THE AMERICAN CANAL AT EL PASO, TEXAS. For primary bibliographic entry see Field 6E. W74-03986

DISCHARGE SYSTEM FOR THE A.D. EDMONSTON PUMPING PLANT, California State Dept. of Water Resources, Sacramento. For primary bibliographic entry see Field 3B. W74-04038

A BRIEF WATER-RESOURCES APPRAISAL OF THE TRUCKEE RIVER BASIN, WESTERN NEVADA, Geological Survey, Carson City, Nev. A. S. Van Denburgh, R. D. Lamke, and J. L. Hughes.

Nevada Division of Water Resources, Water Resources—Reconnaissance Series Report 57, 1973. 122 p, 6 fig, 1 plate, 9 photo, 24 tab, 51 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Nevada, Hydrologic data, Data collections, Hydrology, Water utilization, Streamflow, Runoff, Lakes, Hydrogeology, Water wells, Aquifer characteristics, Water yield, Water level fluctuations, Water analysis, Chemical analysis, Water types, Water supply.
Identifiers: *Truckee River basin(Nev).

The study area for this water-resources appraisal in Nevada lies at the western edge of the Great Basin and encompasses 12 hydrographic areas but excludes the Lake Tahoe basin. Eleven of the areas are part of the Truckee River drainage basin, and the 12th, the Fernley area, borders the basin to the east. Altitudes in the study area range from 10,778 feet atop Mt. Rose to 3,460 feet at the deepest point in Pyramid Lake (depth, 335 feet). Precipitation averages 5 to 10 inches per year at lower altitudes, and more than 40 inches in the higher mountain areas. Within the Truckee River basin in 1969, 43,000 acre-feet of water was withdrawn for domestic, public-supply, and industrial use. About 70% of the total is obtained from the Truckee River and Hunter Creek. The remainder, about 12,000 acre-feet per year, is pumped from wells. The greatest groundwater withdrawal is made to supply the Reno-Sparks municipal system. Groundwater ranges from dilute (specific conductance less than about 600 micromhos, dominated by calcium, sodium, and bicarbonate) in and near recharge areas and near streams, to saline (more than 5,000 micromhos, dominated by sodium and chloride) in the lowest, downgradient areas. The quality of surface waters deteriorates in a downstream direction, culminating in the saline waters of Pyramid Lake (about 5,000 mg per liter of dissolved solids) and Fernley Sink (more than 50,000 mg per liter). (Woodard-USGS)
W74-04047

SOIL MOISTURE TRENDS ON SAGEBRUSH RANGELANDS,
Agricultural Research Service, Boise, Idaho.
Northwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W74-04074

FIRE CLIMATES IN THE SOUTHWEST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. A. Fosberg, and R. W. Furman.
Agricultural Meteorology, Vol 12, p 27-34, 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Phenology, *Moisture availability, *Arid climates, *Burning, *Forest fires, Forest management, Dry seasons, Drying, Seasonal, Range management, Range grasses, Brushlands, *Arizona, *New Mexico, Southwest U.S.

The climates of the arid southwestern states of Arizona and New Mexico were examined in terms of forest and range fire behavior. Mean equilibrium moisture content during the season of high fire danger was defined in terms of temperature and humidity. Phenological stages of the lesser herbaceous vegetation were used to evaluate the moisture content of the fine fuel complex which influences fire behavior, and were taken as integrators of available moisture. Climatological boundaries were primarily defined by marked transition in the equilibrium moisture content field. The secondary delineator used was the time-space domain of the fine fuel moisture complex. Such techniques are currently employed by fire control and weather agencies to evaluate fire potential in the study region. (Muller-Arizona)
W74-04130

CULVERTS FOR FLOW MEASUREMENT IN IRRIGATION SYSTEMS,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, W. R. Walker, and V. S. Boonkirk.
Transactions of the ASAE (American Society of Agricultural Engineers), 1973, p 287-293. 8 fig, 2 tab, 9 ref.

Descriptors: *Discharge measurement, *Flow measurement, Structures, *Culverts, *Irrigation canals, *Lateral conveyance structures, Irrigation water, Irrigation efficiency, Conduits, Flumes, Flowmeters, Flow, Weirs.

The submerged flow analysis used for flow measuring flumes and weirs can be applied to free surface outlet control flow in culverts. Discharge ratings for horizontal culverts can be presented graphically on a single plot. Inlet control, free surface outlet control, and submerged outlet control conditions are investigated and presented in this graphic form. The result concludes that culverts may feasibly be used as flow-measuring structures in irrigation systems. This implies existing culverts may be used to make discharge measurements, and that small portable culverts may be similarly employed. This has applications in arid regions where agriculture is dependent on irrigation and where irrigation water is transported in culverts rather than pipes. (Muller-Arizona)
W74-04131

SEMI-PORTABLE SHEET METAL FLUME FOR AUTOMATED IRRIGATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-04138

HYGIENIC EVALUATION OF A MACHINE FOR APPLYING GRANULATED HERBICIDES IN CANALS OF THE COLLECTOR-DRAINAGE NETWORK, (IN RUSSIAN),
Vsesoyuzny Nauchno-Issledovatel'skii Institut Gigenii i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W74-04166

DRAINAGE DESIGN AS INFLUENCED BY CONDITIONS IN THE VICINITY OF THE DRAIN LINE,
California Univ., Davis. Dept. of Water Science and Engineering.
J. N. Luthin.
Completion Report UCAL-WRC-W-112, February 1972, 2 p, 1 ref. OWRR A-031-CAL(2).

Descriptors: *Design, *Pipes, *Drainage, *Drains, Flow, Soils, Gravel.

An experimental study of the effect of various drain parameters on the flow into the drain was completed. The experiments indicate a much

larger effect of drain diameter on flow into drains than previous theoretical considerations. Doubling the drain diameter gave a 35-60 percent increase while tripling the drain diameter gave a 90-130 percent increase. Decreasing the pipe segment length from three feet to one foot increased the rate of flow more than 2-1/2 times. In the case of a pipe wrapped with fiberglass the increase was about 50 percent. Tests made of placing the drain holes on top or in the bottom of the drain pipe indicate that there is no effect in the flow if allowance is made for the change in hydraulic head drop. Tests made of a drain running empty, 1/4 full or 1/2 full failed to find any effect of water level in the drain except as it affects the hydraulic head. The second experiment measured the movement of various soil materials into gravel envelopes of various materials. Single-sized separates rates such as pea gravel, etc., are not effective in preventing the movement of fine sands and silts into drain lines. Gravel envelopes should not contain materials smaller than a No. 40 sieve since these small particles will move into the drain lines. A gravel envelope containing an appreciable amount of particles between the 10 and 40 sieve will probably prevent the movement of fine sands and silt. Particles larger than No. 10 apparently reduced the effectiveness of the envelope. Field soils containing clay and having good natural structure do not require an envelope since the cohesive forces greater than the seepage forces.
W74-04200

WATER RESOURCES OF WISCONSIN, ST. CROIX RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-04275

4B. Groundwater Management

WATER BALANCE OF A SMALL LAKE IN A PERMAFROST REGION,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W74-03758

WATER RESOURCES OF THE NEW JERSEY PART OF THE RAMAPO RIVER BASIN,
Geological Survey, Washington, D.C.
J. Vecchioli, and E. G. Miller.
Available from Sup Doc, GPO Washington, D.C. 20402, Price \$2.20. Water-Supply Paper 1974, 1973. 77 p, 29 fig, 4 plate, 4 tab, 30 ref.

Descriptors: *Water resources, *Groundwater resources, *Surface waters, *Water resources development, *New Jersey, Aquifer characteristics, Hydrology, Water wells, Well data, Pumping, Water yield, Hydrogeology, Groundwater recharge, Runoff, Streamflow, Water quality, Water temperature.
Identifiers: *Ramapo River basin(N.J.).

The Ramapo River, a major stream in the Passaic River basin, drains an area of 161 square miles, 70% of which is in Orange and Rockland Counties, N.Y., and 30% is in Bergen and Passaic Counties, N.J. The hydrology of the New Jersey part of the basin is described and the feasibility of developing large groundwater supplies from the stratified drift in the Ramapo River valley by inducing recharge to the aquifer from the river is evaluated. Data include construction features and yield characteristics of wells, chemical quality of ground and surface water, streamflow variability, lithology of the valley fill, groundwater withdrawals, and the effect of groundwater pumping on streamflow. Small domestic supplies of groundwater can be obtained nearly everywhere, but the Brunswick Formation is the only consolidated-rock aquifer in the basin that can be depended upon to yield 100-200 gallons per minute to wells. Supplies of more than

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Group 4B—Groundwater Management

1,000 gpm are available from wells tapping the stratified drift in the Ramapo valley. The drift supplies 75% of the groundwater pumped for public supply in the basin. (Woodard-USGS)
W74-03806

WATER-LEVEL DECLINES AND GROUNDWATER QUALITY, UPPER BLACK SQUIRREL CREEK BASIN, COLORADO,
Geological Survey, Denver, Colo.
D. L. Bingham, and J. M. Klein.
Colorado Water Resources Circular 23, 1973. 21 p., 7 fig, 2 plate, 3 tab, 12 ref.

Descriptors: *Groundwater resources, *Water quality, *Water level fluctuations, *Colorado, Hydrologic data, Hydrogeology, Water wells, Aquifer characteristics, Water yield, Withdrawal, Water utilization, Water analysis, Chemical analysis, Observation wells, Data collections, Watershed management.
Identifiers: *Black Squirrel Creek basin(Colo).

Groundwater resources are summarized for the alluvial aquifer of the upper Black Squirrel Creek basin in Colorado. Included are groundwater levels and groundwater quality data that were collected from 1970 to 1972, and selected data from previous studies. The alluvial aquifer consists of water-bearing gravel, sand, silt, and clay that occupies channels eroded in the underlying formations. Groundwater-level declines of 10 feet or more in a 15-square-mile area and declines of 20 to 35 feet over a 5-square-mile area have been observed in the alluvial aquifer during 1964-71. The saturated thickness of the aquifer exceeds 40 feet in about 40 square miles of the 350-square-mile basin. Present trends indicate a continued lowering of the water table. Water of good chemical quality, dissolved-solids concentration less than 250 mg per liter, underlies the central part of the basin. The dissolved-solids concentration increases laterally from the central part of the basin. (Woodard-USGS)
W74-03808

WATER AVAILABILITY AND GEOLOGY IN MARION COUNTY, ALABAMA,
Geological Survey of Alabama, University.
L. V. Causey, K. D. Wahl, P. Jefferson, and W. F. Harris, Jr.
Alabama Geological Survey Map 105, 1972. 31 p., 3 fig, 2 maps, 6 tab, 17 ref.

Descriptors: *Water resources, *Geology, *Alabama, *Surface waters, *Groundwater resources, Water quality, Hydrologic Data, *Maps, Data collections, Geological surveys, Aquifer characteristics, Water wells, Water yield, Hydrogeology, Streamflow, Average flow, Low flow, Water storage, Water utilization, Chemical analysis, Well data.

Rocks that crop out in the eastern part of Marion County in northwest Alabama include sandstones and shales of Mississippian and Pennsylvanian age that dip southward about 50 feet per mile. The sandstones are poor aquifers and expected yields are generally less than a quarter of a million gallons per day (mgd) per well. The western part of the county is underlain chiefly by sands and clays of Late Cretaceous age that dip southwestward about 25 feet per mile. The saturated sands will yield as much as 0.5 mgd per well. Streamflow is the principal potential source of large supplies of water in the county. The average runoff is about 850 mgd. The discharge of the Buttabatchee River, the largest stream, averaged 311 mgd at the gaging station below Hamilton during 1940-65. The annual minimum flows at that station ranged from 12 mgd to 36 mgd during the period 1951-65 and the median annual 7-day low flow was 30.4 mgd. Water from sandstone aquifers is generally hard and high in iron content; whereas water from unconsolidated sand aquifers is soft and locally high in

iron content. Water from the streams is generally soft and low in mineral content. About 1.5 mgd of water is developed from aquifers and less than 1 mgd is developed from streams. (Woodard-USGS)
W74-03810

WATER AVAILABILITY IN MOBILE COUNTY, ALABAMA,
Geological Survey of Alabama, University.
P. C. Reed, and J. F. McCain.
Map 121, 1972. 45 p., 7 fig, 5 tab, 20 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Alabama, Hydrologic data, Hydrology, Basic data collections, Streamflow, Flow rates, Water wells, Aquifer characteristics, Hydrogeology, Well data, Water yield, Groundwater recharge, Water utilization, Water resources development, Water analysis.

Large quantities of water are available throughout Mobile County, Alabama. Annual rainfall is 64 inches; estimated runoff is 28 inches; and estimated groundwater recharge exceeds 12 inches 1 mgd or more per well. Alluvium and low terrace deposits in the Mobile River basin are potential sources of 0.5 to 1 mgd per well. The total average flow of streams that flow through Mobile County into Mississippi and those that discharge into Mobile Bay and Mississippi Sound is about 41,000 mgd. The Mobile River, largest source of surface water, has an average flow of 39,400 mgd and a median annual 7-day low flow of 7,750 mgd east of Mount Vernon. Groundwater is soft and low in dissolved solids except in areas adjacent to Mobile River, Mobile Bay, and Mississippi Sound. Generally surface water is soft and has a dissolved-solids content of less than 100 mg/liter except in areas affected by saltwater intrusion. The estimated average daily use of water in Mobile County in 1967 is 846 mgd. Of this, 805 mgd was surface water and 41 mgd was groundwater. (Woodard-USGS)
W74-03811

APPRaisal OF GROUND-WATER AVAILABILITY AND MANAGEMENT PROJECTIONS, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
R. D. MacNish, D. A. Myers, and R. A. Barker.
Washington State Department of Ecology Water-Supply Bulletin No 37, 1973. 25 p., 14 fig, 3 ref.

Descriptors: *Groundwater resources, *Washington, *Oregon, *Aquifer characteristics, Water yield, Water wells, Water utilization, Irrigation, Hydrologic data, Hydrographs, Maps, Hydrogeology, Groundwater recharge.
Identifiers: *Walla Walla River basin.

The Walla Walla River basin in southeastern Washington and northeastern Oregon covers about 1,750/square miles and is underlain by a basal aquifer that yields water to wells at rates ranging from 30 to 3,000 gallons per minute. In the central lowland part of the basin, about 200 square miles of the basal aquifer is overlain by a gravel aquifer that averages 200 feet in thickness and supplies water to wells at rates ranging from 5 to 900 gpm. There has been a sixfold increase in electrical-power consumption by irrigators since 1950. The decline of water levels in the basal aquifer at a rate of up to 15 feet per year in areas of heavy pumping is probably due mostly to the increasing rate of groundwater withdrawal from the basal aquifer, rather than to the permanent removal of large quantities of water from storage. Although withdrawal of groundwater from the gravel aquifer is extensive, this aquifer is only lightly stressed and, with efficient management, could greatly increase its present annual yield of 75,000 acre-feet of water. Further withdrawal from the basal aquifer is possible, although administrative restrictions on further development in the heavily pumped areas are likely. (Woodard-USGS)
W74-03812

tions on further development in the heavily pumped areas are likely. (Woodard-USGS)
W74-03812

GROUNDWATER DATA IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES, CALIFORNIA, SPRING 1970 TO SPRING 1973,

Geological Survey, Menlo Park, Calif.
C. E. Lamb, and M. J. Mermad.
Open-file report, August 31, 1973. 131 p., 2 tab.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Water quality, *California, Basic data collections, Water level fluctuations, Water analysis, Chemical analysis.

Identifiers: *Santa Barbara County(Calif), *San Luis Obispo County(Calif).

This compilation is part of a continuing program to monitor the groundwater resources in and adjacent to Santa Barbara County, California. The purpose is to assist Santa Barbara County in its program of water management. Included in the compilation are water-quality and water-level data obtained during the period spring 1970 to spring 1973. Wells are listed in numerical order by township, range, and section. (Woodard-USGS)
W74-03814

COST ANALYSIS OF GROUNDWATER SUPPLIES IN THE NORTH ATLANTIC REGION, 1970,

Geological Survey, Washington, D.C.
D. J. Cedstrom.

Available from GPO, Washington, D.C. 20402
Price - 60 cents. Water-Supply Paper 2034, 1973.
48 p., 9 fig, 14 tab, 10 ref.

Descriptors: *Cost analysis, *Water costs, *Groundwater, *Northeast U.S., *Water supply, Water wells, Water utilization, Municipal water, Industrial water, Drilling, Well casings, Pipes, Well spacing, Aquifer characteristics, Pumping, Costs, Reviews.

Methods are presented for calculating costs of groundwater supplies for municipal and industrial uses from the various aquifers in the North Atlantic Region and the range in costs of the supplies. The capital cost of groundwater and the cost per thousand gallons in typical geologic and hydrologic environments are given in tabular form and graphs. The cost of municipal and industrial groundwater at the wellhead in the North Atlantic Region in 1970 generally ranged from 1.5 to 5 cents per thousand gallons. Water from crystalline rocks and shale is relatively expensive. Water from sandstone is less expensive. Costs of water from sands and gravels in glaciated areas and from Coastal Plain sediments range from moderate to very low. In carbonate rocks costs range from low to fairly high. Data show the cost of water at the wellhead based on the average yield of several wells. The cost of water delivered by a well field includes costs of connecting pipe and of wells that have the yields and spacings specified. Cost of transport of water from the well field to point of consumption and possible cost of treatment are not evaluated. (Woodard-USGS)
W74-03815

DEWATERING OF THE CLAYTON FORMATION DURING CONSTRUCTION OF THE WALTER F. GEORGE LOCK AND DAM, FORT GAINES, CLAY COUNTY, GEORGIA,
Geological Survey, Atlanta, Ga.

J. W. Stewart.
Water-Resources Investigations 2-73, January 1973. 22 p., 13 fig, 1 tab, 7 ref.

Descriptors: *Dam construction, *Dewatering, *Groundwater, *Georgia, *Alabama, Aquifer characteristics, Groundwater movement, Trans-

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Groundwater Management—Group 4B

missivity, Surface-groundwater relationships, Storage coefficient, Hydrogeology, Groundwater recharge, Drainage engineering. Identifiers: Walter F. George Lock and Dam, *Chattahoochee River.

This reservoir is the largest manmade structure in the South and extends over 2.5 miles across the flood plain of the Chattahoochee River at Fort Gaines, Clay County, in southwest Georgia and in Henry County, in southeast Alabama. The multipurpose dam consists of two rolled-filled earth dikes, a concrete spillway, a single-stage lock with an 88-foot lift, and a 130,000 kilowatt capacity powerhouse. During dewatering, the potentiometric surface was lowered from a pre-pumping altitude of about 115 to 120 feet above msl to a minimum altitude of about 40 feet above msl, or near the bottom of the 'shell' limestone. The stage of the Chattahoochee River ranged from about 20 to 60 feet above the potentiometric surface at the dewatering sites. The Chattahoochee River seemingly is recharging the Clayton Formation near the damsite, possibly through large solution cavities such as were observed during construction of the spillway site at the river. Some underground leakage is expected to occur at the damsite because of the cavernous condition of the limestone, particularly on the Alabama side of the river. (Woodard-USGS)

W74-03819

THE HYDRAULICS OF ARTIFICIAL RECHARGE,

Technische Hogeschool, Delft (Netherlands).

L. Huisman.

Paper No 9 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970, Vol 1: The Water Research Association, Marlow, England, p 223-262, June 1971. 33 fig, 2 tab, 4 ref.

Descriptors: *Artificial recharge, *Water spreading, *Recharge ponds, Infiltration, *Groundwater movement, Water treatment, Water quality, Hydraulics. Identifiers: *The Netherlands.

The aquifers available for artificial recharge in the Netherlands are rather fine grained, with the 10% diameter passing between about 0.1 and 0.3 mm. Artificial recharge by injection was tried, but was a failure, the acceptance rate dropping to a few cu m per hr after a few months of service. Only surface spreading methods are used, with a combined capacity of about 120 million cu m per yr. The entrance velocity of the water into the subsoil varies from about 0.1 to 0.5 m per day. With better pretreatment, rates of 2 m per day with open ditches and 6 m per day with covered ditches (and no algae growth) are feasible. The detention time in the subsoil governs the improvement in water quality by self-purification as well as by mixing. With the existing schemes, minimum detention times are about 4 weeks. When the length of travel in the subsoil is so small (less than 50 m for instance) short circuiting can cause the minimum detention time to become dangerously low. Periods of interrupted supply, due to an insufficient quantity or quality of the river water, pollution of this water, or a break in the pipeline carrying the water from the river to the recharge area, vary from 1 to 3 months. (Knapp-USGS)

W74-03820

BOREHOLE RECHARGE: THE COMPATIBILITY OF RECHARGE WATER WITH THE AQUIFER,

California Univ., Davis. Dept. of Civil Engineering.

R. B. Krone.

Paper No 10 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970, Vol 2: The Water Research Association, Marlow, England, p 263-277, June 1971.

Descriptors: *Artificial recharge, *Injection wells, *Water quality, *Clogging, Aquifer characteristics, Permeability, Water chemistry, Boreholes, *Dissolved solids.

For waters to be recharged through wells, the dissolved gas concentrations should be less than the saturation concentrations at temperatures and pressures that will occur in the aquifer. Aeration should be avoided and the recharge water temperature should be the same or greater than that of the aquifer. The dissolved solids concentration should be such that a sodium adsorption ratio less than 3 and as low as is feasible be maintained, and the concentrations of dissolved substances should be suitable for the most sensitive use at the discharge sites. Precipitation of compounds resulting from combination of recharge water and aquifer water should be avoided. The suspended solids concentration should be as low as is attainable. The recharge waters should be chlorinated to minimize biological growths. While these requirements are restrictive, they are justified in most cases by the high permeability necessary for a satisfactory well, by the high costs of constructing recharge wells, and by the uncertain results of clogged well rehabilitation. (Knapp-USGS)

W74-03822

PILOT SCALE INVESTIGATIONS OF WELL RECHARGE USING CORED SAMPLES,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 5D.

W74-03823

CLOGGING IN RECHARGE WELLS, CAUSES AND CURES.

Geological Survey, Little Rock, Ark.

R. T. Sniegoocki, and R. F. Brown.

Paper No 13 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970, Vol 2: The Water Research Association, Marlow, England, p 337-357, June 1971. 2 fig, 11 ref.

Descriptors: *Artificial recharge, *Injection wells, *Clogging, *Water quality, Water treatment, Silt-ing, Turbidity, Chemical reactions, Air entrainment, Aquifer characteristics, *Pre-treatment(Water).

Artificial recharge of surface water to groundwater storage is a valuable water management tool. Injection of water into aquifers through wells has generally resulted in partially clogging the aquifer. The clogging is due to air entrainment, the presence of suspended material, the growth of micro-organisms, or the chemical incompatibility of the injected water with the aquifer environment. A clogged recharge well generally can be redeveloped to some degree through the use of chemicals and backflushing. However, pretreatment of the injected water to remove suspended material and make it chemically compatible with the aquifer environment will minimize clogging and promote preservation of the aquifer. (Knapp-USGS)

W74-03824

GROUNDWATER RECHARGE FOR WASTE WATER RECLAMATION AND/OR STORAGE OF SUPPLIES: A COST COMPARISON WITH CONVENTIONAL METHODS,

Asian Inst. of Tech., Bangkok (Thailand).

For primary bibliographic entry see Field 5D.

W74-03825

THE FUTURE PROSPECTS OF ARTIFICIAL GROUNDWATER RECHARGE,

California Univ., Berkeley.

For primary bibliographic entry see Field 5D.

W74-03826

THE EFFECT OF FLUX AND GRAVITATIONAL FORCES ON MISCELLANEOUS DISPLACEMENT IN A THIN HOMOGENEOUS BED, Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.

For primary bibliographic entry see Field 2F.

W74-03826

GROUND-WATER HYDRAULICS IN AQUIFER MANAGEMENT,

Stanford Univ., Calif. Dept. of Geology.

E. Aguado, and I. Remson.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Proceedings paper No 10287, p 103-118, January 1974. 3 fig, 4 tab, 8 ref.

Descriptors: *Aquifer management, *Linear programming, *Hydraulics, *Groundwater, *Methodology, Optimization, Constraints, Physics, Flow, Equations, Mathematical models, Systems analysis.

Identifiers: *Finite differences.

Several authors have advocated incorporating the physics of aquifers into groundwater management models. A method is presented which attempts to include groundwater variables directly as decision variables in linear programming management models; thus finite-difference approximations of the governing differential equations become constraints in the LP formulation. The methodology first replaces the differential equations of groundwater flow by finite-difference approximations that include unknown sink/source terms. The resulting system of algebraic linear equations has a rectangular matrix of coefficients. This system, together with linear inequalities relating sink/source terms, heads or both, and together with an objective function, forms a linear programming model. The method is applied to small-scale models of confined and unconfined saturated flow for steady-state and transient cases. The steady-state LP models are solved using available computer codes. For the transient confined model, the Crank-Nicolson scheme is used, and a single LP problem is solved covering all of the time steps. For the transient unconfined model, a predictor technique is used, and a LP problem is solved at each corrector step. The optimal solutions are consistent with the results of traditional analyses. The method seems to be useful for studying the physical behavior of a groundwater system as some economic or management goal is achieved by the optimizing of some linear function of the variables. (Bell-Cornell)

W74-03913

THE GROUND-WATER DEPLETION ALLOWANCE UNDER THE FEDERAL INCOME TAX,

Kansas State Univ., Manhattan. Dept. of Economics.

For primary bibliographic entry see Field 6E.

W74-03962

LOOKING FOR POLLUTION UNDER THE EARTH,

For primary bibliographic entry see Field 5B.

W74-04004

A BRIEF WATER-RESOURCES APPRAISAL OF THE TRUCKEE RIVER BASIN, WESTERN NEVADA,

Geological Survey, Carson City, Nev.

For primary bibliographic entry see Field 4A.

W74-04047

HYDROGEOLOGY OF THE PRINCIPAL AQUIFERS IN SULLIVAN AND GREENE COUNTIES, INDIANA,

Geological Survey, Indianapolis, Ind.

For primary bibliographic entry see Field 2F.

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

W74-04049

EFFECTS ON WATER QUALITY IN THE SHALLOW AQUIFER DUE TO THE OPERATION OF THE CROSS STATE DUMP, PALM BEACH COUNTY, FLORIDA,

Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 5B.
W74-04052

ENCYCLOPEDIC DICTIONARY OF EXPLORATION GEOPHYSICS,

Chevron Oil Co., Houston, Tex. Geophysical Div.
For primary bibliographic entry see Field 8B.

W74-04142

A GENERAL PRESSURE BUILDUP THEORY FOR A WELL IN A CLOSED DRAINAGE AREA,

Stanford Univ., Calif.

For primary bibliographic entry see Field 8B.
W74-04144

TRANSIENT PRESSURE TESTING OF FRAC-TURED WATER INJECTION WELLS,

Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 8G.

W74-04147

EFFECT OF ADJACENT EXPANSIBLE FLUIDS AND CAPROCK LEAKAGE ON BUILDUP AND DRAWDOWN BEHAVIOR OF WELLS IN AN AQUIFER,

Michigan Univ., Ann Arbor.

M. C. Miller, M. R. Tek, and D. L. Katz.

Society of Petroleum Engineers Journal, Vol 6, No 3, p 239-246, September, 1966. 12 fig, 11 ref.

Descriptors: *Permeability, *Aquifer characteristics, *Leakage, *Compressibility, Diffusivity, *Drawdown, Porous media, Reservoir, Storage coefficient, Darcy's law.
Identifiers: Caprock leakage, Expansible fluids, Constant-pressure boundary.

Methods of determining in situ reservoir properties from drawdown or buildup tests on wells are extended to include the effects of adjacent expansible fluids or caprock leakage. Such problems are met in examining the behavior of wells in an aquifer adjacent to an unknown gas field, or adjacent to a gas storage reservoir. Similar deviations from the expected analytical results may result from leakage through a caprock. A quantitative evaluation is made of increases in the indicated compressibility and permeability caused by the presence of an expansible fluid as a function of the distance between the pumping and the observation well and the distance between the pumping well and the expansible fluid (as a line of constant pressure). The influence of leakage through the caprock from a constant pressure source upon indicated in situ properties is given as a function of the permeability and thickness of the caprock. (Gray-NWWA)
W74-04152

EFFECTS OF PUMPING FROM THE OHIO RIVER VALLEY ALLUVIUM BETWEEN CARROLLTON AND GHENT, KENTUCKY,

Geological Survey, Reston, Va.

D. V. Whitesides, and P. D. Ryder.

Kentucky Geological Survey, Information Circular 18, Series X, 1969. 20 p, 9 fig, 18 ref.

Descriptors: *Wells, *Groundwater, *Drawdown, *Infiltration, *Alluvial Aquifers, Pumping, *Kentucky, *Ohio River, Industrial water, Water demand.
Identifiers: Induced infiltration.

Total storage of ground water in the alluvial aquifer in the Carrollton-Ghent, Kentucky area is limited because of the moderate thickness and relatively small areal extent of the aquifer. Recent industrial expansion coupled with increased ground water withdrawals in the area caused water levels to decline as much as 30 feet from 1968 to mid-1969. Water levels in areas remote from centers of heavy pumping are about normal and fluctuate seasonally. Total amount of ground water available for withdrawal in the Carrollton-Ghent area is about 10.5 billion gallons. Total pumping from closely spaced industrial wells is about 14 million gallons per day, resulting in excessive drawdown in localized pumping areas. Induced infiltration from the Ohio River has sustained yields of several million gallons per day in similar areas. Accurate knowledge of induced filtration characteristics at each heavily pumped area is lacking. This knowledge and proper location of wells near and parallel to the river would help solve the problem of insuring an adequate water supply without excessive drawdown in this area. (Staplin-NWWA)
W74-04155

FARM GROUND WATER NITRATE POLLUTION - A CASE STUDY,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 5B.
W74-04158

EVALUATION OF GROUNDWATER RESOURCES IN LIVERMORE VALLEY, CALIFORNIA,

California Univ., Berkeley. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2F.
W74-04201

A NUMERICAL MODEL OF MULTIPHASE FLOW AROUND A WELL,

Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).

F. Sonier, P. Bessel, and O. Ombrat.
Society of Petroleum Engineers Journal, Vol 13, No 6, p 311-320, December 1973. 9 fig, 2 tab, 7 ref, append.

Descriptors: *Wells, *Drawdown, *Discharge(Water), *Oil fields, *Simulation analysis, Mathematical models, Numerical analysis, Model studies.
Identifiers: Multiphase flow.

A two-dimensional three-phase numerical model simulates two- or three-phase coning behavior in wells discharging water, oil, and gas. The model is fully implicit with respect to all variables and uses the simultaneous solution of the different equations describing multiphase flow. Particular attention is given to the well boundary condition, which is considered to be a physical boundary. The mathematical expression of these well conditions enables flow rates to be calculated in a perfectly implicit manner and thus makes the model very stable so that the computational error in time is very small. The results of several tests are presented. The model was checked by the simulation of several water coning cases that had previously been studied on a physical model. (Knapp-USGS)
W74-04258

EFFECTS OF THE FEEDER CANAL ON THE WATER RESOURCES OF THE FORT LAUDERDALE PROSPECT WELL-FIELD AREA,

Geological Survey, Miami, Fla.

For primary bibliographic entry see Field 5G.
W74-04259

WATER-MANAGEMENT STUDIES OF A STREAM-AQUIFER SYSTEM, ARKANSAS RIVER VALLEY, COLORADO,
Geological Survey, Pueblo, Colo.
O. J. Taylor, and R. R. Luckey.
Ground Water, Vol 12, No 1, p 22-38, January-February 1974. 9 fig, 3 tab, 9 ref.

Descriptors: *Surface-groundwater relationships, *Conjunctive use, *Alluvial channels, *Mathematical models, *Colorado, Water management(Applied), Phreatophytes, Reservoir operation, Planning.
Identifiers: *Arkansas River(Colo).

A mathematical model was developed and used to simulate the stream-aquifer system in the Arkansas River valley in southeastern Colorado, from Pueblo to the Colorado-Kansas State line. The model simulates the interrelations among groundwater and surface water including reservoirs, losses, and transmountain diversions, utilizing various water-distribution rules. The model was used to analyze 24 water-management plans designed to reduce shortages in the irrigation supply. One management plan simulated salvage of water from phreatophyte evapotranspiration, different reservoir operation regulations, use of imported groundwater and surface water, a new reservoir, additional groundwater use, and application of excess streamflow. The resulting annual dependable supply was increased from 610,000 acre-feet to 870,000 acre-feet relation to an annual demand of 1,100,000 acre-feet. The model can be used as a tool to analyze other water-management plans. (Knapp-USGS)
W74-04262

WAT'S NEW IN DEEP-WELL INJECTION, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5E.
W74-04265

BASE OF FRESH GROUND WATER (APPROXIMATELY 3,000 MICROMOS) IN THE SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-04274

WATER RESOURCES OF WISCONSIN, ST. CROIX RIVER BASIN, Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-04275

4C. Effects On Water Of Man's Non-Water Activities

INVESTIGATION OF THE EFFECTS OF URBANIZATION ON PRECIPITATION TYPE, FREQUENCY, AREAL AND TEMPORAL DISTRIBUTION, PHASE II,
Rutgers - The State Univ., New Brunswick, N.J.
Water Resources Research Institute.
M. D. Shulman, and E. A. Brotak.
Availability from NTIS as PB-227 232 \$4.00 in paper copy, \$1.45 in microfiche. Technical Completion Report, October 1973. 83 p, 7 fig, 23 tab, 40 ref. OWRR B-044-NJ(3). 14-31-0001-3615.

Descriptors: *Precipitation(Atmospheric), *Meteorological data, *Rainfall disposition, *Weather patterns, *Temporal distribution, Rain, Local precipitation, Meteorology, Climatology, *Urbanization, Distribution patterns, *New York.
Identifiers: *Areal distribution, Markov chain analysis.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

From a previous phase of research fifty years of daily precipitation values were available on tape for a network of 20 stations in the N.Y. metropolitan area. The earlier study showed that under certain wind conditions, precipitation augmentation was discerned downwind of the urban complex. However, the present study indicates that the urban area does not have any effect on daily precipitation patterns. Analyses were also made of probabilities of wet and dry periods of different lengths using the Markov chain probability model. These results will be valuable in many areas of planning, especially activity scheduling and economic risk taking. Also, the analysis of the average year at Hightstown gives an insight into the processes which govern precipitation patterns in this area. One of the major goals was accomplished with the establishment of a huge data bank with daily precipitation values for a network of stations. Many future analyses can now be run on these data, especially if data from other stations become available. (Shippey-New Jersey)
W74-03768

FLOW RESISTANCE OVER SHORT SIMULATED VEGETATION AND VARIOUS TALL SIMULATED VEGETATION GROUPINGS ON FLOW RESISTANCE AND SEDIMENT YIELD, Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2E.
W74-03787

STATEMENT OF PROGRESS ON INVESTIGATION AND ANALYSIS OF FLOOD HYDROGRAPHS FROM SMALL DRAINAGE BASINS IN SOUTH DAKOTA., Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W74-03821

EFFECTS OF DEICING CHEMICALS UPON GROUND AND SURFACE WATERS (INITIAL PROGRAM DEVELOPMENT), Massachusetts Dept. of Public Works, Wellesley Hills. Research and Materials Section.
For primary bibliographic entry see Field 5B.
W74-04149

4D. Watershed Protection

FLOW RESISTANCE OVER SHORT SIMULATED VEGETATION AND VARIOUS TALL SIMULATED VEGETATION GROUPINGS ON FLOW RESISTANCE AND SEDIMENT YIELD, Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2E.
W74-03787

LEVELS OF ASSESSMENT, Upper Mississippi River Basin Commission, Twin Cities, Minn.
For primary bibliographic entry see Field 6B.
W74-04035

EXPERIENCES WITH THE CORRECTION OF DISORDERED STREAMS OF THE ALPINE TYPE, (IN ITALIAN), P. Scatègni. Italy Minist Agric For Collana Verde. 25, p 1-287. 1971. Illus. (English summary).
Identifiers: * Alpine streams, Dams, * Erosion control, Forestation, Slopes, * Streams(Disordered), * Reforestation.

The following remedial measures are given: correction of the hydraulic profiles and gradients of the river valley in order to avoid erosion and slope instability of the sides of the valley; consolidation

and rearrangement of existing unstable slopes; and reforestation of the largest surface of the basin, in order to slacken the speed of superficial and deep waters. The correction of the hydraulic profiles and gradients of the river valley can be obtained providing transversal retaining constructions like small dams designed for overtopping or cross-bars.—Copyright 1973, Biological Abstracts, Inc.
W74-04276

ANTI-EROSIVE ROLE OF NATURAL PLANTS IN LOW FOOT HILLS BORDERING THE FERGHANA BASIN, (IN RUSSIAN), Tashkent Univ. (USSR).

O. Ismatov, and Kh. Azimov. Uzb Biol Zh. Vol 16, No 1, p 39-41. 1972.
Identifiers: Artemisia, Barley, Basins, *Erosive control, Foothills, *Grasses, Phlomis, Poa-Bulbos, Sedge, *USSR(Ferghana basin), *Vegetation establishment, *Plants(Long-rooted).

Using accepted geo-botanical methods 347 spp. of higher plants were found in this USSR locality, and were divided into 4 groups: long-rooted grasses, sedge and barley; Poa bulbosa; perennials, long-rooted plants and plants which send out root suckers (Artemesia, Phlomis); and predominantly biennials and annuals. The anti-erosive ability of these plants is described and discussed.—Copyright 1973, Biological Abstracts, Inc.
W74-04287

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

EFFECT OF POLYESTER FIBER PROCESSING EFFLUENTS ON WATER QUALITY, Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

W. C. Tincher. Availability from NTIS as PB-227 383 \$3.75 in paper copy, \$1.45 in microfiche. Completion Report ERC-1673, November 1973. 51 p, 16 fig, 5 tab, 26 ref. OWRR A-043-GA(1). 14-31-0001-3810.

Descriptors: *Georgia, Organic compounds, *Spectroscopy, Fluorescence, Waste water disposal, Waste water treatment, *Water quality, *Textiles, Dyes, Dye releases, *Industrial wastes, *Aromatic compounds, *Pollutant identification, Plastics, Water pollution sources.
Identifiers: *Biphenyl, Polyester textiles, Carpets, Luminescence.

This study evaluated the contribution of the aromatic hydrocarbons used in large quantities in processing polyester textile products to deterioration of water quality. Biphenyl, a chemical used in processing polyester carpet, received major attention due to the concentration of carpet processing in northeast Georgia. An analytical procedure for detecting biphenyl based on luminescence spectroscopy was developed. This procedure involved removal of organic compounds from water samples by cyclohexane extraction and measurement of the intensity of fluorescence emission at 310 nm with excitation at 265 nm. The procedure is capable of detecting biphenyl in water at concentrations less than 5 micrograms-per-liter. The concentrations found in effluents from plants treating spent carpet dyeing wastes suggest that biphenyl content is little affected by differences in the degree of treatment ranging from none to secondary treatment in municipal plants. Biphenyl concentration decreases rapidly downstream with volatilization into the atmosphere being the most probable loss mechanism. Water samples containing biphenyl were subjected to conditions expected to exist during chlorination of waste treatment plant effluents, and no evidence of conver-

sion of biphenyl to chlorinated species was found. Luminescence studies on water samples from a number of Georgia streams (including municipal water supplies) revealed several organic compounds besides biphenyl. Fluorescence and phosphorescence spectroscopic studies provide an excellent means for detection, identification, and quantification of these organic contaminants.
W74-03761

CATION ADSORPTION AND DESORPTION RATES IN NATURAL WATER STUDIES, Montana State Univ., Bozeman. Dept. of Chemistry.

G. K. Pagenkopf. Availability from NTIS as PB-227 237 \$3.00 in paper copy, \$1.45 in microfiche. Montana University Joint Water Resources Research Center, Montana State University, Bozeman, Report No 45, December 1973. 14 p, 6 fig, 3 tab. OWRR A-057 MONT(1).

Descriptors: *Ion exchange, *Cation adsorption, *Cathodes, *Electrochemistry, Natural streams, Heavy metals, Cadmium, Calcium, Electrodes, Monitoring, Pollutant identification.

Identifiers: *Calcium ION, Hydrous iron oxide, Adsorbed heavy metals, *Ion selective electrodes.

The adsorption of calcium ion onto hydrous iron oxide was investigated. The adsorption and desorption rates are fast, thus indicating that hydrous oxide surfaces act as metal ion buffering agents in natural water systems. Competitive adsorption studies indicate that calcium ion can displace adsorbed heavy metals such as cadmium. The applicability of a calcium ion selective electrode to environmental monitoring was also investigated. The electrode is subject to interference from phenolic type compounds and thus not suitable for use in waters where these compounds may be present. (Williams-Montana)
W74-03765

PRECIPITATION AS A NUTRIENT AND HYDROGEN ION SOURCE FOR FORESTED WATERSHEDS IN THE MISSOULA VICINITY, Montana Univ., Missoula. School of Forestry. For primary bibliographic entry see Field 5B. W74-03766

A FEASIBILITY STUDY OF A RESEARCH PROGRAM ON THE SOURCE, DEGRADATIVE REMOVAL AND SECONDARY CONSEQUENCES OF PETROLEUM PRODUCTS IN WATER, New Hampshire Univ., Durham. Dept. of Chemistry.

K. K. Anderson, P. R. Jones, G. G. Lyle, R. E. Lyle, and C. W. Owens. Availability from NTIS as PB-227 240 \$3.00 in paper copy, \$1.45 in microfiche. University of New Hampshire, Durham, Water Resources Research Center, Final Report, November 1973. 4 p. OWRR A-033-NH(1). 14-31-0001-3829.

Descriptors: *Gasoline, *Oil pollution, *Organic compounds, Aqueous solutions, Gas chromatography, Separation techniques, *Pollutant identification, *New Hampshire.
Identifiers: *Lake Pawtuckaway(NH).

This feasibility study concentrated on the detection of hydrocarbons in lake water and in water artificially contaminated with gasoline. The analytical procedure described easily detected 1 ppm of gasoline in freshly prepared aqueous solutions. Water from Lake Pawtuckaway was analyzed. Only slight traces of material, presumably hydrocarbon in nature, were detected. It is estimated that these contaminants were present at roughly 10 ppb. A final attempt at detecting hydrocarbon residues was made. Fish grown in water with and without hydrocarbon contaminants

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

were analyzed for hydrocarbons using an extraction procedure designed in conjunction with gas chromatographic system. It was hoped that the fish might concentrate certain hydrocarbon contaminants in effect multiplying the sensitivity of the analytical techniques. No differences in extracts from the two fish were observed.
W74-0376

APPLICATION OF REMOTE SENSING TO RIVER MECHANICS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-03800

WATER RESOURCES OF THE NEW JERSEY PART OF THE RAMAPO RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-03806

WATER-LEVEL DECLINES AND GROUND-WATER QUALITY, UPPER BLACK SQUIRREL CREEK BASIN, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-03808

WATER RESOURCES OF THE NORTHERN CHEYENNE INDIAN RESERVATION AND ADJACENT AREA, SOUTHEASTERN MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-03809

WATER AVAILABILITY IN MOBILE COUNTY, ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 4B.
W74-03811

SELENIUM IN NEBRASKA'S GROUNDWATER AND STREAMS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 5B.
W74-03813

GROUNDWATER DATA IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES, CALIFORNIA, SPRING 1970 TO SPRING 1973,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-03814

CHEMICAL QUALITY OF SURFACE WATER IN THE EASTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
W. J. Shampine.

New York Department of Environmental Conservation Basin Planning Report ORB-6, 1973. 100 p.
36 fig, 6 tab, 39 ref, append.

Descriptors: *Water quality, *Chemical analysis, *Surface waters, *New York, Streams, Lakes, River basins, Hydrologic data, Precipitation(Atmospheric), Streamflow, Flow rates, Runoff, Geology, Overland flow, Base flow, Sampling, Water analysis, Water chemistry, Geochemistry, Correlation analysis, Discharge(Water), Water pollution sources.
Identifiers: *Oswego River basin(N.Y.).

The Eastern Oswego River basin is an area of about 2,500 square miles in central New York. The basin may be subdivided into four regions characterized by surface water of distinctive chemical

quality: Regions I (roughly the northern one-third of the basin), II A (the southern one-third of the basin), and II B (a triangular area in the northwestern corner of the basin) are characterized by calcium bicarbonate type water with average dissolved-solids contents of 80, 200, and 700 mg/liter, respectively; Region III (an east-west band across the central part of the basin) is characterized by calcium sulfate type water and a dissolved-solids content of about 700 mg/liter. Water from Regions I, II A, and II B is suitable for public and private supplies with little treatment. The more highly mineralized water from Region III, particularly in the Onondaga Lake area, including Syracuse, is unsuitable for most uses without treatment. (Woodard-USGS)
W74-03817

DISTRIBUTION OF ZR, TI, NI, CO, PB, CU, AND OTHER ELEMENTS IN THE SURFACE LAYER OF RECENT SEDIMENTS OF LAKE BALKHASH (RASPREDELENIYE ZR, TI, NI, CO, PB, CU I DRUGIHK ELEMENTOV V POVERKHNOTSTROM SLOVE SOVREMENNYYKH OSA DKOV OZ. BALKHASH),
Adademiya Nauk SSSR, Moscow. Geologicheskii Institut.

For primary bibliographic entry see Field 2H.
W74-03827

BASIC TYPES OF RECENT BOTTOM SEDIMENTS OF THE MEDITERRANEAN SEA, THEIR MINERALOGY AND GEOCHEMISTRY (OSNOVNYYE TIPY SOVREMENNYKH DONNYKH OSADKOV SREDIZEMNOGO MORYA, IKH MINERALOGIYA I GEOKHIMIYA),
Adademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.

For primary bibliographic entry see Field 2J.
W74-03828

LAKES OF THE BOL'SHOY PATOK RIVER BASIN (NORTHERN URALS). THEIR IMPORTANCE AND PRESERVATION (OZERA BASSEYNA R. BOL'SHOY PATOK (PRIPOLYARNYY URAL), IKH ZNACHENIYE I OKHRANA),
For primary bibliographic entry see Field 2H.
W74-03832

IRON ORE IN LAKES OF VOLOGDA OBLAST (ZHELEZORUDNYYE OZERA VOLOGODSKOY OBLASTI),
For primary bibliographic entry see Field 2H.
W74-03833

TEST FOR ANTICHOLINESTERASE MATERIALS IN WATER,
Edgewood Arsenal, Aberdeen Proving Ground, Md.

R. M. Gamson, D. W. Robinson, and A. Goodman. Environmental Science and Technology, Vol 7, No 13, p 1137-1140, December 1973. 2 fig, 1 tab, 10 ref.

Descriptors: *Pollutant identification, *Methodology, *Organophosphorus compounds, *Water pollution, Water analysis, Organophosphorus pesticides, Phosphothioate pesticides, Hydrogen ion concentration, Pollutants, Water temperature, Enzymes, Chemical analysis, Chemical reactions.

Identifiers: *Enzymatic inhibitors, *Anticholinesterases, Horse serum cholinesterase, Detection limits, Sensitivity, Trace levels, Chemical indicators, Sarin, Parathion, Chromogenic reagents, Enzyme activity.

A simple device containing paper impregnated with cholinesterase is reported for detection of organophosphorus inhibitors in the ppb to ppm range in water. The device is a polypropylene 'ticket', 1

in. wide, 2 in. long, and 1/16 in. thick, round at one end, and square at the other. The round end is wetted with buffer (pH 8) and the substrate (2,6 dichloroindophenol acetate in lignine) is added from a dispenser. After a short waiting period, the round end is observed for blue color development which serves as a control for the presence or absence of enzyme activity. The appearance of the blue color indicates that the system is operating properly; it also means that a cholinesterase inhibitor is not present. No change in color is indicative of the presence of a hazard. Optimum performance is obtained at 20°C and pH 8. Under these conditions, the enzyme is completely inhibited in 20 min or less by 10 ppb up to 1 ppm depending on the inhibitor. Comparison of inhibition data with rate constants indicates that the sensitivity of the device to any given inhibitor can be estimated if the rate constant value is known for that inhibitor with horse serum cholinesterase. Experimental data are presented on studies with the organophosphorus esters isopropyl methylphosphonofluoride (Sarin), O-ethyl S(2-diisopropylamino) ethyl methylphosphonothioate, and O,O-diethyl O-p-nitrophenyl phosphorothioate (parathion). (Holoman-Battelle)
W74-03838

BIOLOGICAL EFFECTS OF OCEAN DISPOSAL OF SOLID WASTE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W74-03840

STABILITY OF DILUTE STANDARD SOLUTIONS OF ANTIMONY, ARSENIC, IRON AND RHENIUM USED IN COLORIMETRY,
Loughborough Univ. of Technology (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-03842

INSTRUMENTAL PARAMETERS FOR DETERMINATION OF MERCURY BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry and Biochemistry.
R. R. Brooks.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1306-1312, November 1973. 7 fig, 9 ref.

Descriptors: *Water analysis, Soil analysis, *Mercury, Fish, Sediments, Heavy metals, Organic matter, Aqueous solutions, Rocks, *Spectrophotometry, *Instrumentation.

Identifiers: Atomic absorption spectrophotometry, Instrumental parameters, Biological samples, Flameless AA, Reproducibility, Accuracy.

Studies have been made on the instrumental parameters affecting the performance of the solution-reduction and the thermal-volatilization techniques of flameless atomic absorption for mercury. Optimum conditions established for the solution-reduction technique were: gas flow 5 L/min, stirring time 100 sec, and stirring rate at least 1250 rpm. Optimum conditions for the thermal-volatilization technique were: flow rate 1.5 L/min, heating time 20 sec. The reproducibility and time requirements of the two methods are compared, and guidelines are given on the application of the methods to various kinds of samples such as fish, rocks, sediments, and soils. (Little-Battelle)
W74-03844

NITRATE DETERMINATION BY A MODIFIED CONWAY MICRODIFFUSION METHOD,
Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

For primary bibliographic entry see Field 2G.
W74-03845

MICROBIOLOGICAL DETERMINATION OF THIRAM, Belgium Pharmaceutical Association, Brussels. A. Rappe, G. Mauquoy, and S. Baur. Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1517-1518, November 1973. 1 tab, 12 ref.

Descriptors: *Pesticides, *Pollutant identification, Food processing industry, Separation techniques, Pesticide residues, Bioindicators, *Bioassay, Fungicides, Fungi.

Identifiers: *Thiram, *Saccharomyces carlsbergensis*, *Bacillus licheniformis*, *Flavobacterium*, Microbiological determination, Nabam, Ziram, Captan, Ferbam, Agars, Culture media, Detection limits.

A rapid and simple agar plate method has been developed for the microbiological determination of thiram, using *Saccharomyces carlsbergensis* ATCC 9080 as the test organism. With this organism, as little as 25 ng thiram/well or 200 ng/disk can be detected, well below the levels that can be detected with either *Bacillus licheniformis* or *Flavobacterium* as the test strain. The choice of the technique used for assay (well or disk) will depend on the nature of the solvent and the amount of thiram to be analyzed. The assay technique was applied to the dietetic carrot paste preparation spiked with known amounts of thiram. An inhibition zone appeared for 10 ppm thiram, or 10 micrograms thiram/g sample. Although other fungicides, such as nabam, ziram, and captan, also exhibit an antibacterial effect on the 3 strains tested, the effect is at higher concentrations. With *Saccharomyces carlsbergensis*, the limit of detection using the disk method is 2 micrograms for nabam and 1 microgram for ziram or captan. Mercuric derivatives also have an antibacterial activity and thus can be detected by the assay described. The lower limit of detection of phenylmercury nitrate is 1 microgram. (Mortland-Battelle)

W74-03846

CONSOLIDATION CHARACTERISTICS OF DREDGING SLURRIES, Northwestern Univ., Evanston, Ill. Technological Inst.

A. B. Salem, and R. J. Krizek.
Journal of the Waterways Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 99, No WW4, p 439-457, November 1973. 15 fig, 3 tab, 8 ref.

Descriptors: *Heavy metals, *Suspended solids, *Chemical oxygen demand, Oil, *Nutrients, Water analysis, Clays, Nitrogen, Ammonia, Phosphates, Iron, Organic compounds, Lead, Mercury, Carbon, Potassium, Copper, Sodium, Calcium, Consolidation, Soil mechanics, *Ohio.
Identifiers: *Dredge spoils, Characterization, Grease, Volatile solids, Cyanides.

As part of a study of the consolidation characteristics of dredging slurries, dredgings from various sites around Toledo, Ohio, were chemically analyzed. Compositions were as follows: clay, 30-53 percent; total solids, 12.0-43.4 percent; volatile solids, 7.0-14.6 percent; COD, 80-185 mg/gm; organic N, 0.4-5.3 mg/gm; ammonia-N, 0.4-1.7 mg/gm; phosphates, 0.14.2 mg/gm; oil and grease, 0.11.9 mg/gm; hydrocarbons, 0.6-8 mg/gm; iron, 0.3-31.8 mg/gm; cyanide, 0.11.8 micrograms/gm; lead, 50-181 micrograms/gm; mercury, 0.0-4 micrograms/gm; and organic C, 0.7-6 percent. The dredging water contained 0.025 ppm Pb, 0.085 ppm Cu, 14-32 ppm K, 0-30 ppm Na, 0-132 ppm Ca, and 0-80 ppm Fe. (Little-Battelle)

W74-03847

TRACE ORGANICS IN WATER: THEIR ISOLATION AND IDENTIFICATION, Ames Lab., Iowa.

A. K. Burnham, G. V. Calder, J. S. Fritz, G. A. Junk, and H. J. Svec.
Journal American Water Works Association, Vol 65, No 11, p 722-725, November 1973. 3 fig, 1 tab, 6 ref.

Descriptors: *Organic compounds, Water pollution, *Pollutant identification, *Isolation, Methodology, Water analysis, Gas chromatography, Organic wastes, Pollutants, Water pollution sources, Separation techniques, Solvent extractions, *Iowa, *Delaware River, Potable water, Chemical analysis.

Identifiers: *Trace levels, Data interpretation, Mass spectra, XAD-2 method, Triglycidochloride, Elution, Chloroethoxyether, Benzothiazole, Methylbenzothiazole, 2-Thiomethylbenzothiazole, Toluene, Benzene, Pentane, Octane.

A new method for isolating and concentrating organic compounds in potable water involves passing the water through a column packed with XAD-2 polystyrene macroreticular resin, and eluting the mostly neutral, sorbed organic compounds with an appropriate solvent (e.g., ethyl ether). After sorption and elution, the solvent is evaporated, the neutral organics separated by gas chromatography, and the individual compounds identified with a mass spectrometer coupled to the column. Gas chromatography is used in quantitative determinations. Except for the MS identification, the method is simple and relatively rapid; the concentration and elution steps are both quantitative, and when tested, all the organic compounds were recovered in their original form. The method has been used for concentrating and identifying neutral organic impurities in the water of two Iowa cities and of the Delaware River. Data on water from Ames, Iowa, show the distribution of hydrocarbons with respect to geographical proximity to a source of pollution. (Holoman-Battelle)

W74-03848

PROBLEMS IN PHENOLICS-MODELING METHODS IN THE OHIO RIVER AT WHEELING, W. VA., Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. of Science.

F. C. Vigani.
Journal American Water Works Association, Vol 65, No 11, p 725-731, November 1973. 9 fig, 6 tab, 2 ref.

Descriptors: *Forecasting, *Mathematical models, *Ohio River, Water analysis, Data processing, *West Virginia.

Identifiers: *Data interpretation, *Phenolics.

An attempt was made to develop a forecasting function for phenolics in Ohio River water at Wheeling, W. Va., by fitting a time-series model to phenolic data obtained during 1963-1968. The analysis of the data revealed unexpected information on the effect of operator bias on the reported data. Although the historical data are unsuitable for modeling what is occurring in the river, they do reveal information about the activities of the operators in the treatment plant. When the operator bias is removed from the data, there is essentially no structure to the residuals, which indicates no apparent physical or assignable cause relationship in the phenolics-concentration data. The problem that very high concentrations of phenolics affect water quality remains. All available evidence indicates that these rare events follow no deterministic pattern. The extreme values of phenolics concentration may be caused by at least three factors: analytical problems, slugs of non-industrial origin, and extraordinary industrial discharges. (Little-Battelle)

W74-03849

FORMATION OF PENTAFLUOROBENZYL DERIVATIVES FOR THE IDENTIFICATION AND QUANTITATION OF ACID AND PHENOL PESTICIDE RESIDUES, Iowa Univ., Iowa City. State Hygienic Lab.

L. G. Johnson.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1503-1505, November 1973. 1 fig, 3 tab, 9 ref.

Descriptors: *Pollutant identification, *Pesticide residues, *Phenolic pesticides, Chlorinated hydrocarbon pesticides, Pollutants, *Gas chromatography, Organic pesticides, 2,4-D, Phenols, Trace elements.

Identifiers: *Pentafluorobenzyl esters, *Ethers, Derivatives, Electron capture gas chromatography, Cleanup, Sample preparation, p,p'-DDA, Sensitivity, sec-Amyl phenols, 1-Naphthol, p-Nitrophenol, Retention time, m-(1-Methylbutyl) phenol.

A procedure is described for the preparation and electron capture GLC determination of pentafluorobenzyl ester and ether derivatives of 2,4-D, p,p'-DDA, 1-naphthol, p-nitrophenol, and sec-amyl phenols. A column cleanup procedure quantitatively isolates the derivatives from excess reagents and other interferences. The method can be used as an aid in the confirmation of the identity of pesticide residues and for the quantitative determination of extracted residues. (Holoman-Battelle)

W74-03850

EVALUATION OF A LOW-COST ARSENIC AND SELENIUM DETERMINATION AT MICROGRAM-PER-LITER LEVELS, Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.

J. S. Caldwell, R. J. Lishka, and E. F. McFarren.
Journal American Water Works Association, Vol 65, No 11, p 731-735, November 1973. 2 fig, 7 tab, 9 ref.

Descriptors: *Water analysis, *Pollutant identification, *Methodology, Evaluation, Chemical analysis, Pollutants, Water supply, Monitoring, Inorganic compounds.

Identifiers: *Selenium, *Arsenic, *Trace levels, Chemical recovery, Chemical interference, Atomic absorption spectrophotometry, Organometallics, Disodium methyl arsenate, Lead arsenate, o-Arsanilic acid, o-Nitrobenzene-arsenic acid, Selenium oxide, Sodium selenite.

New methods and modifications of known methods of detecting arsenic and selenium in water are described. The modifications are concerned with converting inorganic arsenic and selenium into gaseous hydrides that can be swept into an argon-hydrogen flame of an atomic absorption spectrophotometer. Organic arsenic compounds can be determined like the inorganic compounds after a preliminary digestion with a mixture of nitric, sulfuric, and perchloric acids. Such a procedure does not appreciably interfere with inorganic As determinations. Organic Se was not investigated. Gas-flow rate, Zn concentration, burner head position in relation to light path, and the use of a single-slot burner head were investigated in relation to the decrease of sensitivity and/or extension of the determination range. The previous procedures for these elements are extremely tedious and time consuming, but these new procedures can be performed in a few minutes - thereby permitting routine monitoring of water supplies for As and Se. (Holoman-Battelle)

W74-03851

TREATMENT OF OILY AND METAL-CONTAINING WASTEWATER, Weston (Roy F.), Inc., West Chester, Pa.

For primary bibliographic entry see Field 5B.

W74-03852

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

IDENTIFYING SOURCE OF PETROLEUM BY INFRARED SPECTROSCOPY, Rhode Island Univ., Kingston. Dept. of Chemistry.

P. F. Lynch, and C. W. Brown.
Environmental Science and Technology, Vol 7, No 13, p 1123-1127, December 1973. 4 fig, 3 tab, 9 ref.

Descriptors: *Water pollution sources, *Oil pollution, *Oil spills, *Pollutant identification, Water pollution, Chemical analysis, Computers, Data processing, Methodology.

Identifiers: *Infrared spectrophotometry, *Data interpretation, Crude oil, Fuel oil, Petroleum products, Oil characterization, Kerosene, Petroleum distillates, No. 2 fuel oil, Absorptivity.

The infrared spectra of over 50 samples of crude oils, fuel oils, and other petroleum products have been measured using a Perkin-Elmer Model 521 infrared spectrometer. Bands in the 650-1200/cm² spectral region were characteristic of each sample and can be used to identify the source of the sample. Computer analysis of absorptivities of 21 selected bands was used to match unknowns with the correct knowns by taking the ratios of known to unknown absorptivities. The method was demonstrated on laboratory samples and on a sample taken from an actual oil spill. The method of analysis is rapid and it provides unambiguous identification for petroleum products, eliminating the need for adding tracer materials to petroleum products or for other methods of analysis. (Holoman-Battelle)

W74-03854

IN-PLANT BIOLOGICAL MONITORING,

J. Cairns, Jr., and R. E. Sparks.
Industrial Water Engineering, Vol 10, No 5, p 22-24, September/October 1973. 6 fig.

Descriptors: *Industrial wastes, *Water quality, *Bioassay, *Monitoring, Animal physiology, Water pollution effects, Fish, Laboratory equipment, Data processing, Water pollution control, *Bioindicators.

The quality of plant effluents can be monitored by recording the breathing rate, swimming rate or other physiological activities of fish and other organisms subjected to the effluent in tanks. After baseline values have been established with unpolluted water, the presence of toxic substances can be detected by the occurrence of abnormal activity. The sensor signals can be sent to a computer which automatically compares the values with baseline values and sounds an alarm in the event of significant changes. If the alert were sounded, the effluent would be analyzed to detect the toxic pollutant and its sources. The method is also potentially useful for river management. (Little-Battelle)

W74-03855

BRAVE NEW WORLD OF TOC AND TOD.

Industrial Water Engineering, Vol 10, No 5, p 13-17, September-October 1973. 3 fig.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Monitoring, *Sewage effluents, Water quality, Automatic control, Water treatment.

Identifiers: *Total organic carbon, *Total oxygen demand.

Because of the shortcomings of BOD and COD tests and time required to obtain results, they are unsatisfactory for real-time control of treatment plant effluents. As a result total organic carbon (TOC) and total oxygen demand (TOD) are being used for this purpose. Although there is no rigorous correlation between TOC and BOD or COD, because of the general consistency of effluent compositions, they all show the same trends. TOC is based on the automatic measure-

ment of the oxygen required to combust the impurities of a water sample. TOD correlates well with COD when interferences are not present. The correlation between TOD and BOD depends on the specific sample. Typical examples of applications of TOC and TOD are discussed and several commercially available instruments are described. (Little-Battelle)

W74-03856

DIFFERENTIAL ELECTROLYtic POTENTIOMETRY WITH PERIODIC POLARISATION. PART XXI. INTRODUCTION AND INSTRUMENTATION,

Exeter Univ. (England). Dept. of Chemistry.

E. Bishop, and T. J. N. Webber.

Analyst, Vol 98, No 1171, p 697-711, October 1973. 9 fig, 45 ref.

Descriptors: *Instrumentation, *Electrodes, Laboratory equipment, *Electrochemistry, Chemical analysis, Volumetric analysis.

Identifiers: Differential electrolytic potentiometry, *Ion selective electrodes, Potentiometric titration, Periodic polarization, Platinum electrodes, Silver electrodes, Silver halide electrodes, Antimony-antimony oxide electrodes.

Previous work on periodic polarisation of indicator electrodes is reviewed and discussed, and is faulted on the premise that perfectly symmetrical, bias-free waveforms may not have been used. The fabrication, activation and testing of electrodes is described, waveform generators are critically discussed, and measuring instruments for periodic and d.c. potentials are both described and evaluated. A simple device for interfacing instruments to recorders, offering a high degree of band spread, is described. High-voltage square-wave generation by use of relays is also discussed. Waveform monitoring was a crucial factor in the work, and the accurate balancing of shape, amplitude and half-cycle duration is described. Frequency measurement and timing by means of a crystal clock, and amplitude and bias detection by integration and by d.c. differential electrolytic potentiometry, are appraised. Finally, the working assembly is described, together with the technique for the elimination of electrical interference. (See also W74-03860) (Holoman-Battelle)

W74-03859

DIFFERENTIAL ELECTROLYtic POTENTIOMETRY WITH PERIODIC POLARISATION. PART XXII. SYMMETRICAL PERIODIC CURRENT DIFFERENTIAL ELECTROLYtic POTENTIOMETRY IN OXIDATION - REDUCTION TITRIMETRY,

Exeter Univ. (England). Dept. of Chemistry.

E. Bishop, and T. J. N. Webber.

Analyst, Vol 98, No 1171, p 712-724, October 1973. 9 fig, 4 tab, 16 ref.

Descriptors: *Aqueous solutions, *Electrochemistry, *Volumetric analysis, *Electrodes, Chemical analysis, Instrumentation, Copper, Iron.

Identifiers: Potentiometric titration, Differential electrolytic potentiometry, Periodic polarization, Precision, End-point errors.

The application of pure, symmetrical, bias-free square, sine and triangular wave periodic polarisation to all types of oxidation-reduction titrations is reported. Electrode configuration and earthing and the destructive effect of bias are examined. Titration curve shapes are the same as those of classical d.c. differential electrolytic potentiometry, but the periodic current densities required are much higher than for d.c. The electrode response speed is greatly accelerated, unpoised potentials are steady, warning is given of the approach of the end-point in type II (b) titrations, electrodes retain full activity for very long periods and errors in titrations of iron (II) with

dichromate or cerium (IV) are eliminated in the periodic method as against the d.c. method. Discrimination in type II reactions is slightly attenuated in the periodic method, and in titrations at low concentrations it is considerably attenuated. The nature and the conditions of the titration, the speed of the electrode charge-transfer process, the ballast load, the current density, the electrode area, the shape of the applied waveform, the applied frequency, and the deactivation of electrodes, are examined in detail. The benefit of the constant-current mode over the constant-potential mode is demonstrated. (See also W74-03859) (Holoman-Battelle)

W74-03860

COLORIMETRIC DETERMINATION OF BORON IN AQUEOUS SOLUTIONS AND IN BOROSILICATE GLASS BY SOLVENT EXTRACTION,

General Electric Corporate Research and Development, Schenectady, N.Y.

A. S. Tenney.

Journal of the Electrochemical Society, Vol 120, No 9, p 1284-1285, September 1973. 2 fig, 4 ref.

Descriptors: *Colorimetry, *Aqueous solutions, *Boron, Water analysis, *Spectrophotometry, Absorption.

Identifiers: *Sample preparation, *Detection limits, Chemical interference, Calibration curves.

Boron in aqueous solutions can be determined by adding dilute HF and methylene blue solution to the sample in a polyethylene dropping bottle, shaking, allowing to stand for one hour, adding 1,2-dichloroethane, shaking, allowing to stand overnight, and reading the absorbance in the range 4000-7000 Angstroms with a double-beam recording spectrophotometer. Standards are prepared from boric acid solution. Absorbance curves show three peaks at 4900, 6050-6300, and 6750 Angstroms. Calibration curves show that boron can be determined in the range 0.5 micrograms/ml with an uncertainty of plus or minus 0.05-0.1 microgram/ml using results from the two major peaks. The detection limit is about 0.1 microgram in a 2.0 ml sample. The procedure is simpler than other methods because the double-beam spectrometer subtracts absorbance of the blank and because no procedure is employed to remove interfering ions such as NO3(-), As(5 minus) and Cr(6 minus). (Little-Battelle)

W74-03862

DETERMINATION OF FLUORINE IN PETROLEUM AND PETROLEUM PROCESS CATALYSTS WITH A FLUORIDE ELECTRODE,

British Petroleum Co. Ltd., Sunbury-on-Thames (England).

J. N. Wilson, and C. Z. Marczewski.

Analytical Chemistry, Vol 45, No 14, p 2409-2412, December 1973. 4 fig, 2 tab, 16 ref.

Descriptors: *Fluorine, *Pollutant identification, *Electrodes, Methodology, Chemical analysis, Halogens, Electrochemistry, Solvent extractions, Separation techniques, Volumetric analysis.

Identifiers: *Petroleum process catalysts, *Petroleum products, *Sample preparation, Fluoride electrodes, Crude oil, Petroleum residues, Precision, Repeatability, Fuel oil, Spindle oil, Chemical recovery, Detection limits, Alaskan crude, Arabian light crude, Arabian heavy crude, Iranian light crude, Iranian heavy crude, Petroleum distillates, Fluoridized catalysts, Iraq crude, Kuwait crude, Libyan crude, Nigerian crude, p-Fluorobenzoic acid.

Procedures have been developed for the preparation of analytical solutions from crude oils, residues, products, and process catalysts, suitable for the direct measurement of fluoride ion concentration with a fluoride electrode. Finely ground

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

catalyst samples are mixed with the fusion flux, heated, dissolved in water, buffer is added, and the EMF measured. For crude oil or residues or petroleum products, a quantity is weighed, dried, reweighed, and twice extracted in a separatory funnel. The aqueous phase was further extracted, diluted with water, and neutralized for the measurement of the EMF. Under the conditions described for the analysis of catalysts, the electrode response was Nernstian down to concentrations of 0.4 ppm fluoride, and deviated only very slightly between 0.4 and 0.1 ppm fluoride. The analysis of petroleum samples was completed entirely in the non-Nernstian region of electrode response. Fluoridated catalysts were analyzed by the above method and by thorium nitrate titration following a standard Willard and Winter distillation. Generally good agreement was obtained for the 2 methods; the new method was about 5 times as quick and yielded much closer duplicates. Repeatable results were obtained with 10 crude oils using maximum sample sizes of 2.5 g. The limitation of sample size did not apply to distillate products, and determinations are possible at levels as low as 10 parts per billion. The series of light distillates presented show the excellent repeatability of the method over a wide range of fluoride concentrations. (Holoman-Battelle)

W74-03864

DIRECT DETERMINATION OF SULFIDE BY RAPID DIRECT CURRENT POLAROGRAPHY,
Melbourne Univ., Parkville (Australia). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 2K.

W74-03865

SIMULTANEOUS DETERMINATION OF FERROCYANIDE AND FERRICYANIDE IN AQUEOUS SOLUTIONS USING INFRARED SPECTROMETRY,
Kokak (Australasia) Pty Ltd., Coburg (Australia). Research Labs.

D. M. Drew.

Analytical Chemistry, Vol 45, No 14, p 2423-2424, December 1973. 1 fig, 2 tab, 14 ref.

Descriptors: Aqueous solutions, *Chemical analysis, *Pollutant identification, Cations, Anions, *Spectrophotometry.

Identifiers: *Infrared spectrophotometry, *Ferrocyanides, *Ferricyanides, Absorbance, Chemical interference, Sodium thiosulfate, Ammonium sulfate, Molar absorptivity.

An infrared spectrophotometric procedure has been described for the simultaneous determination of ferricyanide and ferrocyanide in aqueous solutions. Photographic bleach and fixer samples were analyzed after dilution by a factor of five to bring the concentrations of ferricyanide and ferrocyanide into the analytical range. The spectrum was recorded in the region from 2200 to 2000/cm; the absorbance of ferricyanide was obtained at 2115/cm and ferrocyanide at 2040/cm. Absorbance readings taken from five determinations show standard deviations of plus or minus 0.02A for both species. For the interference work, the study was restricted to the effect of anions and cations most common to the photographic solutions in question. The determination of ferrocyanide was not affected by the presence of sodium thiosulfate and ammonium sulfate either separately or together. Ammonium sulfate had no effect on the determination of ferricyanide. Sodium thiosulfate was not added to the later solutions because of its reaction with ferricyanide. (Holoman-Battelle)

W74-03866

COLUMN PARTITION CHROMATOGRAPHIC DETERMINATION OF SODIUM ALKANE MONOSULFONATES,
Texaco Trinidad, Inc., Pointe-a-Pierre (Trinidad). Research Lab.

W. R. Ali, and P. T. Laurence.

Analytical Chemistry, Vol 45, No 14, p 2426-2428, December 1973. 1 fig, 3 tab, 15 ref.

Descriptors: *Separation techniques, *Chromatography, *Sulfonates, Detergents, Surfactants.

Identifiers: Sodium alkane monosulfonates, Column chromatography, *Monosulfonic acids, Sample preparation, Organic acids, Disulfonic acids, Polysulfonic acids.

Alkane monosulfonic acids can be quantitatively separated from di- and (poly-) sulfonic acids over a wide range of carbon number (C9-C20) by a column partition chromatographic method using moist cellulose packing. After washing cellulose with water and drying, a slurry was prepared by blending cellulose with water and petroleum ether. This slurry was packed in the chromatographic columns to a depth of 30 cm. Acid samples from which sodium sulfate was removed were pipeted directly onto the column and the monosulfonic acids eluted with n-butanol in petroleum ether and the disulfonic acids with water. The two fractions were titrated with alkali using phenolphthalein indicator. 2-Propanol was used as cosolvent in titrating the monosulfonic acid fraction. Results of analysis of one sample at intervals over 9 months showed the repeatability of the method to be very good. (Little-Battelle)

W74-03867

DETERMINATION OF SUBMICROGRAM LEVELS OF PHENOL IN WATER,

Department of the Environment, Burlington (Ontario). Centre for Inland Waters.

P. D. Goulden, P. Brookbank, and M. B. Day.

Analytical Chemistry, Vol 45, No 14, p 2430-2433, December 1973. 4 fig, 7 ref.

Descriptors: *Phenols, *Pollutant identification, *Methodology, *Water analysis, Pollutants, Colorimetry, Solvent extractions, Chemical analysis, Distillation, Aqueous solutions, Separation techniques.

Identifiers: *Trace levels, *Chromogenic reagents, Detection limits, 4-Aminoantipyrine, Chemical interference, 3-Methyl-2-benzothiazolinone hydrazone, Precision.

Continuous distillation equipment which permits the distillation of comparatively large sample flows in an automated system has been used in the determination of phenol in water. The sample flow is distilled and condensed, and after the color formation step utilizing color-developing reagents, the dye is concentrated by extraction into a small solvent flow. This technique has been used with both 4-aminoantipyrine (AAAP) and 3-methyl-2-benzothiazolinone hydrazone (MBTH), at a sample rate of 10 per hour. The limit of detection for the two methods is 0.2 microgram/l. phenol. The coefficient of variation of the AAAP method was 3.6 percent and that of the MBTH method, 2.4 percent. The step that separates the phenols from interfering substances is a single distillation, hence the method is applicable only to those relatively 'clean' waters for which this single distillation constitutes a satisfactory 'clean-up' procedure. (Holoman-Battelle)

W74-03868

IMPROVEMENTS IN THE WET OXIDATION-DITHIZONE METHOD FOR DETERMINING LOW MERCURY LEVELS IN FOOD,
Medical Academy, Gdansk (Poland). Dept. of Bacteriology.

M. Nabrzyski.

Analytical Chemistry, Vol 45, No 14, p 2438-2440, December 1973. 2 tab, 9 ref.

Descriptors: *Separation techniques, *Foods, *Fish, *Water analysis, *Mercury, Colorimetry, Hydrogen ion concentration, Oxidation.

Identifiers: *Biological samples, Sample preparation, Recovery, Chemical interference.

The wet oxidation-dithizone method for determining mercury was improved by successively combining the dithizone extracts obtained from two or more digested samples to prepare one sample richer in mercury. The procedure was tested with samples of fish, milk powder, or rice grains which were oxidized in a flask with a mixture of sulfuric, perchloric, and nitric acids, the contents filtered, diluted with water, divided into two portions, and evaporated. Extraction was carried out by transferring samples into separatory funnels, shaking with acetic acid and chloroform, discarding the chloroform layer, and adding diluted dithizone in chloroform. Extracts were then combined, sulfuric acid and sodium nitrite added, the solutions heated to remove chloroform and nitrous acid, diluted with water and hydroxylamine chloride, cooled, acetic acid added, and the solution run into a separatory funnel. This solution was then analyzed by a visual or colorimetric procedure, both of which are described. Investigations with radioactively labeled samples showed that recovery of Hg was good. Analysis of fish digest to which copper was added showed that copper did not interfere with Hg extraction at pH 0. Since Hg was selectively extracted at this pH, the procedure can be used for simultaneous determination of both elements in foods. The procedure can also be used to analyze natural waters. (Little-Battelle)

W74-03869

ALGAL GROWTH PREDICTION USING GROWTH KINETIC CONSTANTS,
National Inst. for Water Research, Pretoria (South Africa).

For primary bibliographic entry see Field 5C.

W74-03871

EFFECT OF PHENOL ON OXYGEN UPTAKE RATE OF A LABORATORY POPULATION OF CHIRONOMUS ATTENUATUS (WALK.),
Mid-America Nazarene Coll., Olathe, Kans.
For primary bibliographic entry see Field 5C.

W74-03872

THERMOPHILIC FUNGI IN A MUNICIPAL WASTE COMPOST SYSTEM,
Florida Univ., Gainesville, Dept. of Botany.

B. E. Kane, and J. T. Mullins.

Mycologia, Vol 65, No 5, p 1087-1100, September/October 1973. 5 fig, 4 tab, 31 ref.

Descriptors: *Waste disposal, *Cultures, *Sampling, Monitoring, Environmental effects, Temperature, Growth rates, Aerobic conditions, Cellulose, Oxygen, Carbon dioxide, Hydrogen ion concentration, Acidity, Solid wastes, Separation techniques, Carbon, Pigments, Municipal wastes, Pollutants, Pollutant identification.

Identifiers: *Thermophilic fungi, Compost, Aspergillus fumigatus, Chaetomium thermophile, Humicola lanuginosa, Mucor pusillus, Thermoascus aurantiacus, Torula thermophila, Agars.

A high-rate municipal compost system was systematically sampled during the digestion period for the presence of thermophilic fungi. The objectives were to (1) monitor environmental conditions during composting, (2) develop sampling and culturing techniques for isolating thermophilic fungi from compost, and (3) examine environmental requirements for growth of the isolated fungi. The compost consisted of sorted municipal refuse which was shredded, moistened with water or sewage sludge, and piled in tanks. The compost atmosphere, sampling procedures, and culturing techniques used are described and experiments to determine the ability of selected isolates to grow on cellulose are outlined. Pure cultures of 304 isolates were established. These included Aspergillus fumigatus, Chaetomium thermophile, Humicola lanuginosa, Mucor pusillus, Thermoascus aurantiacus, and Torula thermophila. It was demonstrated that (1) a thermophilic relationship exists

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

between temperature and growth, (2) a requirement exists for aerobic growth conditions, and (3) only *C. thermophile* utilized cellulose as a carbon source. It was concluded that thermophilic fungi are present during composting in a mechanically assisted digestion. They were isolated at all times during the composting and there is no apparent succession of species. High temperature, acidity, and anaerobic conditions may limit growth in the interior of the pile and thus restrict the role of these fungi. (Mortland-Battelle)

W74-03875

CHANGES IN CHEMICAL COMPOSITION AND PHYSICAL PROPERTIES OF A HEAVY RESIDUAL OIL WEATHERING UNDER NATURAL CONDITIONS,
Nova Scotia Technical Coll., Halifax.
For primary bibliographic entry see Field 5B.
W74-03877

TEMPERATURE-GRADIENT INCUBATOR FOR THE GROWTH OF CLOSTRIDIUM,
Washington Univ., Seattle. Inst. for Food Science and Technology.

J. R. Matches, and J. Liston.
Canadian Journal of Microbiology, Vol 19, No 9, p 1161-1165, September 1973. 2 fig, 1 tab, 7 ref.

Descriptors: *Clostridium, *Cultures, *Incubation, Thermophilic bacteria, *Bacteria, *Anaerobic bacteria, Laboratory equipment, Design criteria, Temperature, Research equipment.

Identifiers: Incubators, Mesophilic bacteria, Psychrophilic bacteria.

A temperature-gradient incubator was constructed and used for the growth of clostridia. With this instrument the minimum, optimum, and maximum temperatures can be obtained for 12 organisms at one time. The incubator can also be adjusted for psychrophiles and thermophiles. This unit is mounted on wheels, self-contained, and can easily be moved from room to room. The main part of the portable unit is the block of aluminum which measures 36 in. X 13 in. X 4 1/4 in. This block contains 12 rows of 11/16-in. holes 4 in. deep, with 32 holes per row, spaced at 1-in. centers, giving a total of 384 tubes. The block is drilled and tapped at both ends with 1-in. pipe threads through which the cooling and warming liquids are pumped. The antifreeze for the cold end and water for the warm end of the incubator are held in 6.2-gal. stainless steel tanks containing 5.6 gal. each. One bath is cooled with a 1/3 horsepower sealed refrigeration unit connected to a cylindrical shaped evaporator constructed from 3 ft of 1/4-in. copper tubing. The other bath is heated with a 500-W tube-type immersion heater. The temperature in both tanks is controlled with mercury to platinum thermoregulators and solid state mercury plunger relays. The incubator was designed so that the desired temperature could be obtained rapidly and the incubator could be operated with the covers open without appreciable change in the temperature gradient. (Mortland-Battelle)

W74-03878

PHENOTYPIC VARIABILITY OF THE ENVELOPE PROTEINS OF KLEBSIELLA AEROGENES,
Microbiological Research Establishment, Salisbury (England).
For primary bibliographic entry see Field 5C.
W74-03882

A LIQUID ION-EXCHANGE NITRATE-SELECTIVE ELECTRODE BASED ON CARBON PASTE,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
G. A. Qureshi, and J. Lindquist.

Analytica Chimica Acta, Vol 67, No 1, p 243-245, November 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Design criteria, *Nitrates, *Water analysis, Calibrations, Materials, Aqueous solutions, Electrical equipment, *Electrodes, *Pollutant identification.

Identifiers: *Ion selective electrodes, Detection limits, Reproducibility, Nitrate electrodes, Chemical interference, Lifetime, Response time, Storage.

To overcome the disadvantages of inner reference electrodes and membranes, a liquid ion-exchange nitrate selective electrode was constructed using wax-treated carbon powder mixed with Orion Liquid 92-07-02. The wax isolates the carbon to prevent pH-responses from surface oxides. The basic preparation procedure consisted of dissolving ceresin wax in n-hexane, adding graphite powder, heating, mixing the dried powder with the ion-exchange liquid, and compacting in a 10 mm teflon rod fitted with a metal piston which also served as the contact. The reference electrode was a saturated calomel electrode with a fiber junction. Calibration of the electrode in the range of 0.1-0.000001 M sodium nitrate showed reproducibility to be plus or minus 0.2 mV. Response was linear from 0.1 to 10 to the minus 4.5 power with a slope of 58 mV/decade activity. Selectivity was as good or better than that of commercial electrodes when phosphate, sulfate, chloride, bromide, perchlorate, and iodide were present. Response time was 8-10 minutes with a new surface, but decreased to 2-3 minutes. Lifetime was 4-6 months when the electrode was stored in a glass tube. (Little-Battelle)

W74-03884

NORTH CAROLINA MARINE ALGAE. II. NEW RECORDS AND OBSERVATIONS OF THE BENTHIC OFFSHORE FLORA,
Duke Univ., Durham, N.C. Dept. of Botany.

C. W. Schneider, and R. B. Scaries.

Phycologia, Vol 12, Nos 3/4, p 201-211, December 1973. 4 fig, 27 ref.

Descriptors: *Marine algae, *Chlorophyta, *Phaeophyta, *Rhodophyta, *Benthic flora, *North Carolina, Distribution, Marine plants, Kelps, Speciation, Sea water.

Identifiers: Chaetomorpha crassa, Anadyomene stellata, Microdictyon boergesenii, Struvea ramosa, Padina profunda, Dictyota ciliolata, Galaxaura obtusata, Scinaia complanata, Duderstaya crassa, Cryptonemia luxurians, Kallymenia perforata, Predaea masonii, Gracilaria blodgettii, Gracilaria mammillaris, Plocamium brasiliense, Neogardhiella ramosissima, Solieria tenera, Eucheuma isiforme, Gigartina stellata, Botryocladia pyriformis, Agardhiella browniae, Heterosiphonia wurdemannii, Bryothamnion seaforthii.

Twenty new records from North Carolina are reported including four species of green algae, two species of brown algae, and fourteen species of red algae. Nineteen of these collections constitute the northernmost records of these species, though most are found in the Bermudian flora. The other new record, that of *Gigartina stellata* (Stackhouse) Batters, represents a new southern extension for this northern species. Two previously questionable records and one species known only from shallow water in North Carolina are verified as members of the deep water offshore flora. A clarification of the records of *Agardhiella tenera* (J. Agardh) Schmitz in this area is given. (See also W73-00284) (Holoman-Battelle)

W74-03885

A SOLVENT-EXTRACTION METHOD FOR THE DETERMINATION OF MANGANESE-54 IN SEA WATER,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.

W. W. Flynn.

Analytica Chimica Acta, Vol 67, No 1, p 129-134, November 1973. 2 tab, 6 ref.

Descriptors: *Solvent extractions, *Pollutant identification, *Methodology, *Sea water, Chemical analysis, Cations, Heavy metals, Alkaline earth metals, Water analysis, Separation techniques, Pollutants, Colorimetry, Anions, Halogens, *Manganese.

Identifiers: *Mn-54, Chemical recovery, Detection limits, Ionic interference, Rare earth elements, Manganese radioisotopes, Di(2-ethylhexyl) phosphoric acid.

A solvent-extraction procedure is described for the determination of manganese-54 in seawater. The water (1 liter) is buffered to pH 3.8 and extracted with di(2-ethylhexyl) phosphoric acid in n-heptane. The manganese-54 with carrier is stripped from the organic phase, and eventually precipitated as the dioxide; the precipitate is dissolved in hydrochloric acid and counted in a scintillation counter. Chemical recovery is determined colorimetrically. Samples spiked with manganese-54 showed quantitative recovery from 1 liter of seawater with typical recovery of 70-75 percent of carrier. The method is applicable to seawater containing many other ions, and decontamination factors for a wide range of radionuclides are reported. The limit of detection is ca. 0.0000001 microCi/ml. (Holoman-Battelle)

W74-03886

DETECTION AND QUANTITATIVE MEASUREMENT OF FECAL WATER POLLUTION USING A SOLID-INJECTION GAS CHROMATOGRAPHIC TECHNIQUE AND FECAL STEROIDS AS A CHEMICAL INDEX,
Sherbrooke Univ. (Quebec). Dept. of Biochemistry.

J. Dougan, and L. Tan.

Journal of Chromatography, Vol 86, No 1, p 107-116, November 1973. 5 fig, 2 tab, 21 ref.

Descriptors: *Gas chromatography, *Pollutant identification, Separation techniques, Water pollution, Enteric bacteria, Coliforms, Water analysis, Sewage effluents.

Identifiers: *Fecal pollution, *Coprostanone, Sample preparation, Gas liquid chromatography, Thin layer chromatography, Cholesterol, Coprostanol, Steroids.

Gas chromatography was used to detect the fecal steroids, cholesterol, coprostanol, and coprostanone in surface waters to evaluate the usefulness of this procedure for detecting fecal pollution. Samples were extracted with hexane and further processed to produce a residue. This residue was qualitatively analyzed by gas-liquid chromatography by adding dioxane, applying the solution to the spiral part of the solids injector syringe, evaporating, and injecting into a combined OV-1/OV-210 column. The remaining solution was air dried and kept for further purification by thin-layer chromatography. Samples were quantitatively analyzed by injecting the sample and a standard solution into the gas chromatograph, producing traces, and determining weight ratios by cutting and weighing peak areas. Coliform counts were also made on separate portions of the samples for comparison with the results from chromatography. On the basis of the results obtained, coprostanone appears to be the best index of fecal pollution. It is possible to measure this compound at a contamination level in the 400 picogram per milliliter range. No simple relationship seems to exist between coprostanone content of polluted water samples and classical coliform counts. To be most useful the method should be combined with classical microbiological measurements. (Little-Battelle)

W74-03887

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

A STUDY OF MERCURIALS IN THE ELEPHANT BUTTE RESERVOIR ECOSYSTEM, New Mexico Univ., Albuquerque. Dept. of Biology.

For primary bibliographic entry see Field 5C.

W74-03899

APPLICATION OF A NEW METHOD FOR PHOSPHATE CONCENTRATION MEASUREMENTS IN NATURAL AND WASTE WATERS, Wisconsin Univ., Milwaukee. Dept. of Chemistry. C. O. Huber, D. Karweik, and R. E. Reim.

Available from the National Technical Information Service as PB-227 456; \$3.25 in paper copy, \$1.45 in microfiche. University of Wisconsin Water Resources Center Madison Technical Report 73-12, October 1973. 35 p, 6 fig, 9 tab, 23 ref. OWRR A-044-WIS(2). 14-31-0001-3550, 14-31-0001-3850.

Descriptors: *Phosphates, Water pollution sources, *Phosphorus compounds, Analytical techniques, *Nutrients, *Measurement, Cathodes, *Electrodes, *Pollutant identification.

Identifiers: Polyphosphate, Pyrophosphate.

The characteristics of the cathodic response of the lead dioxide electrode to polyphosphate species were examined. Fabrication and response characteristics of various forms of the electrode were investigated. Maximum sensitivity is obtained with an electroplated electrode, but overall convenience and utility indicate the paraffin wax-bound electrode as the device of choice. Scanning electron microscopy showed that the electrode surface consists of approximately 0.01 mm particles protruding from the paraffin "floor." The analytical response was shown to be linear over limited concentration ranges, but showed a saturation effect over larger concentration ranges (0.00001 to 0.01 M). Sensitivity is somewhat specific for each measurement series; therefore, standard addition and titration techniques are the most pertinent analytical procedures. Measurements of various polyphosphate solutions are reported. In addition, the measurement system was successfully applied to hydrolysis rate and metal complex stability evaluations. The electrode reaction provides a new and useful analytical tool for polyphosphate concentrations in water chemistry and water monitoring. The fact that the new method is specific for polyphosphates in the presence of orthophosphate suggests that it should be applicable to many water investigations.

W74-03900

YELLOW-GREEN ALGAE OF WASTES, (IN UKRAINIAN), Kharkov State Univ. (USSR). Dept. of Lower Plants.

T. V. Dohadina.

Ukr Bot Zh. Vol 29, No 1, p 114-116. 1972. (English summary).

Identifiers: Algae, *Tribonema, Wastes, Water chemistry, *Pollutant identification.

Seven species of yellow-green algae were found and determined when studying algal flora of wastes. The data are presented on chemistry of water for each species. Only representatives of the genus Tribonema are often observed in mass development in wastes.—Copyright 1973, Biological Abstracts, Inc.

W74-03919

WATER SAMPLING AND LABORATORY SERVICE, Bridgeport Hydraulic Co., Conn.

A. R. Castorina.

Journal American Water Works Association, Vol 65, No 12, p 806-810, December 1973. 3 photo.

Descriptors: *Water sampling, *Utilities, *Water supply, *Chemical analysis, *Quality control,

Data collections, Laboratory tests, Measurement, Testing procedures, Water analysis, On-site data collections, Evaluation, Water works, Water consumption, Water quality.

Today's water consumer demands uniformly high quality, ample quantity and a reasonable price. To satisfy this demand the water purveyor must have a well-planned analytical program that will provide information essential to producing good water. The analyses must be pertinent since some problems are universally present in all water supplies while others are unique to certain localities. Problems a small water utility faces in checking the quality of its water are discussed; utilities in Connecticut are used as examples. One of the biggest problems is untrained personnel at the water treatment plant. Employment of a consulting laboratory is a viable solution. Determination of what kind of test program is necessary, choice of a competent consultant and the necessity of complete cooperation between the utility and the consultant are also discussed. (Comfort-Florida) W74-04024

LOSS OF MERCURY FROM WATER DURING STORAGE,

Environmental Health Lab., McClellan AFB, Calif.

R. V. Coyne, and J. A. Collins.

Available from NTIS, Springfield, Va. 22151 as AD-757 861. Price \$3.00 printed copy; \$1.45 microfiche. Report No 71M-18, September 1971. 15 p, 1 fig, 4 tab, 20 ref.

Descriptors: *Chemical reactions, *Mercury, *Preservation, *Water sampling, *Laboratory tests, Analytical techniques, Storage, Acids, Hydrogen ion concentration, Correlation analysis. Identifiers: *Mercury loss from water samples.

Rate of loss of mercury from dilute solutions stored in polyethylene containers was studied. Storage conditions and time intervals were similar to those encountered during the normal collection and shipment of water samples to a testing laboratory. Analyses were performed by acid digestion-stannous chloride reduction followed by mercury-vapor atomic absorption measurement. Results indicated losses up to 100% in known added concentrations of mercury; losses were observed from both glass-distilled water and from locally-purchased creek water samples. Some of this loss (approximately 20%) was immediate after adding mercury (0.05 mg/liter) to a container of water; subsequent losses occurred over a matter of a few days. Addition of an acid preservative to a water sample after its collection did not appreciably reduce the loss of mercury as compared to an unpreserved sample; some benefit was obtained by collecting the water sample into a container already containing acid. Of the acids studied (nitric, sulfuric, hydrochloric, phosphoric, acetic), only nitric acid to a final pH of 1 showed any substantial ability to maintain the mercury concentration. The disappearance of mercury was more rapid at the 0.05 mg/liter level than at the 0.5 mg/liter level. (Woodard-USGS) W74-04048

FIELD WATER-QUALITY INFORMATION ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 THROUGH SEPTEMBER 1972, Geological Survey, Anchorage, Alaska.

J. W. Nauman, and D. R. Kernodle.

Basic-Data Report, 1973. 22 p, 1 fig, 3 tab, 9 ref.

Descriptors: *Water quality, *Surface waters, *Baseline studies, *Alaska, *Pipelines, Oil industry, Water analysis, Chemical analysis, Basic data collections, Streams, Rivers, Lakes, Ice, Temperature, On-site investigations.

Identifiers: *Trans-Alaska pipeline corridor.

Field water-quality information was collected during parts of 1970, 1971, and 1972 among the proposed trans-Alaska pipeline corridor. The data include measurements of water and air temperature, specific conductance, alkalinity, pH, dissolved oxygen, chlorophyll 'a' stream discharge, and ice conditions for 69 sites. At 11 stream sites 24-hour studies were conducted, and additional data on barometric pressure, light intensity, percent cloud cover, and wind conditions are presented for these studies. Seasonal turbidity data are presented also. (Woodard-USGS) W74-04054

ABSORPTIOMETRIC DETERMINATION OF TRACE AMOUNTS OF SULPHIDE ION IN WATER,

Mosul Univ. (Iraq). Dept. of Chemistry.

S. A. Rahim, A. Y. Salim, and S. Shereef. Analyst, Vol 98, No 1173, p 851-856, December 1973. 6 tab, 9 ref.

Descriptors: *Sulfides, *Water analysis, Chemical analysis, *Colorimetry, *Absorption, Iron, Hydrogen sulfide, Laboratory tests, Analytical techniques, Pollutant identification.

Identifiers: Absorptiometry.

A sensitive and rapid method for the determination of small concentrations of sulfide in water is based on the reduction of iron(III) to iron(II) by sulfide at pH 3 in the presence of 1,10-phenanthroline reagent, forming the orange-red complex ($C_{12}H_8N_2Fe^{2+}$). The method is subject to some interferences, which fortunately are not usually present in water supplies. Interferences of many acidic and basic radicals can be successfully overcome by recovery of hydrogen sulfide by steam distillation from the samples acidified with sulfuric acid. As little as 0.5 micrograms or a concentration of 33 micrograms per liter of sulfide can be detected by the method if 15 ml of sample are available. (Knapp-USGS) W74-04072

APPLICATION OF THE CARBON CUP ATOMISATION TECHNIQUE IN WATER ANALYSIS BY ATOMIC-ABSORPTION SPECTROSCOPY,

Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

F. Dolinsek, and J. Stupar.

Analyst, Vol 98, No 1173, p 841-850, December 1973. 8 fig, 8 tab, 16 ref.

Descriptors: *Flame photometry, *Spectrophotometry, *Heavy metals, Spectrometers, Spectroscopy, Water analysis, Water quality, Lead, Copper, Cadmium, Equipment, Instrumentation, Pollutant identification.

Identifiers: *Atomic absorption spectroscopy.

A modified, laboratory-made carbon cup (small-scale Massmann) atomizer was designed for atomic-absorption determination of copper, lead and cadmium in water samples. Injection of a 10 microliter sample in one portion is the most convenient technique with respect to sensitivity and speed of operation. Addition of EDTA causes an enhancement of sensitivity, which is considerable when determining lead. The adsorption of these elements on the polyethylene containers was examined in order to evaluate possible errors that may arise after sample storage. The detection limits are 0.45 ng per ml of lead, 1.7 ng per ml of copper and 0.04 ng per ml of cadmium, and the average precision is 3% in a single measurement. (Knapp-USGS) W74-04073

AN ELECTROCHEMICAL METHOD FOR MONITORING THE OXYGEN CONTENT OF AQUEOUS STREAMS AT THE PART-PER-BILLION LEVEL,

Oak Ridge National Lab., Tenn.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

R. E. Meyer, F. A. Posey, and P. M. Lantz.
Desalination, Vol 11, No 3, p 392-340, 1972. 6 fig, 1 tab, 6 ref

Descriptors: *Analytical techniques, *Electrochemistry, *Monitoring, *Oxygen, Technology, Dissolved oxygen.

Theory and apparatus for a device for monitoring dissolved oxygen content of aqueous streams at the part-per-billion level is described. It makes use of an exchanger in which dissolved oxygen in the test stream penetrates an oxygen-permeable membrane and equilibrates with the dissolved oxygen in an internal sensor stream. Oxygen content of the internal sensor stream is then monitored by quantitative reduction in a porous silver electrode maintained at an appropriate potential. Accuracy of the device is one or two ppb in the 0-100 ppb range. On the basis of the measurements made, the device will be especially useful for monitoring dissolved oxygen content of desalination plant streams and other process streams where plant operation and/or corrosion behavior of metallic materials depends critically on the oxygen level. Because of ease of operation, insensitivity to temperature, and freedom from calibration problems, it should be possible to develop instrumentation modules having a wide variety of monitoring and readout capabilities. It has, however, been tested only in the laboratory. Operating experience in a plant is necessary, especially to determine whether the silicone membrane material will maintain its integrity and permeability. (Jones-Wisconsin)
W74-04104

INTERIM ENVIRONMENTAL MONITORING REPORT: JANUARY-JUNE 1973,
Mound Lab., Miamisburg, Ohio.

D. G. Carfagno, and W. H. Westendorf.
Available from NTIS, Springfield, Va., as Rept. No. MLM-2085, \$4 per copy, \$1.45 microfiche. Report No. MLM-2085, August 31, 1973. 21 p, 3 fig, 8 tab, 3 ref, append.

Descriptors: Survey, *Radioactivity, *Radioisotopes, *Monitoring, Measurement, *Assay, Environment, Air pollution, Water pollution, Soil contamination, Agriculture, Food chains, Population, Public health, Fallout, Path of pollutant, Tritium, *Ohio.
Identifiers: *Great Miami River(Ohio), Polonium, Plutonium.

The environment surrounding Mound Laboratory was monitored, and the results for the first half of 1973 are reported. The average concentrations of plutonium-210, plutonium-238, and tritium measured in air and water samples were well within the stringent standards adopted by the Atomic Energy Commission and the Environmental Protection Agency. The results of the analyses of foodstuffs and soil samples for radioactive species, as well as the results of analyses of all samples for non-radioactive species, will be presented in the year-end Annual Environmental Monitoring Report. A slight increase in plutonium-238 in the streams was reflected along with a decreased concentration of tritium. (Houser-ORNL)
W74-04174

COMPARISON OF MEASURED AND CALCULATED RADIATION EXPOSURE FROM A BOILING WATER REACTOR PLUME,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 5B.
W74-04175

EFFECT OF X-IRRADIATION ON THE INCORPORATION OF GLYCINE-C14 IN THE TISSUE OF ATLANTIC SALMON LARVAE,
Polarynni Nauchno-Issledovatel'skii i Proektii Institut Morskogo Rybnogo khozyaistva i Okeanografii, Murmansk (USSR).

For primary bibliographic entry see Field 5C.
W74-04181

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE MONTICELLO NUCLEAR GENERATING PLANT, MONTICELLO, MINNESOTA, AUGUST 1970.

EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-04185

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING BIG ROCK POINT NUCLEAR PLANT, BIG ROCK POINT, MICHIGAN, 1968,

EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-04186

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1970,
Battelle-Pacific Northwest Labs., Richland, Wash. Environmental Evaluations Section.

For primary bibliographic entry see Field 5B.
W74-04192

AERIAL DETECTION OF SPILL SOURCES,

McDonnell Aircraft Co., St. Louis, Mo. Reconnaissance Lab.
C. L. Rudder, A. G. Wallace, and C. J. Reinheimer.

Copy available from GPO Sup Doc as EPL23/2:73-289, \$0.55; microfiche from NTIS as PB-228 105, \$1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-289, September 1973. 23 p, 13 fig, 2 tab, 4 ref. EPA Project 15080.

Descriptors: *Oil spills, Oil pollution, Chemical analysis, Water pollution sources, *Remote sensing, *Aerial photography, *Pollutant identification.

Identifiers: *Photographic interpretations, Color photography, Multiband photography, Petroleum products, Spectral analysis.

An imagery interpretation key of the petroleum industry was developed for use with an aerial surveillance spill prevention system. Aerial baseline and stereogram photographs as well as aerial multiband, aerial oblique, and ground photographs of oil refineries were obtained for inclusion in the key. Processing systems to convert crude oil to fuel and LPG, gasoline, heavy fuel oils, lubricating oils and asphalt were identified with the help of military oil refinery interpretation keys. Three petrochemical facilities within the refinery were also located and identified. The identification of potential spill sources as related to processing systems, product storage and disposition of by-products and waste was performed. The results were confirmed by refinery personnel and included in the oil refinery key. Concurrent with the flight program, fifteen samples of spilled material were obtained along with the appropriate ground truth data. Chemical and spectral analyses of the samples were performed and correlated with the multiband image analysis. Finally the use of aerial photography for temporal change detection was evaluated and included in the appropriate sections of the key. (EPA)
W74-04196

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSES: ASSISTANCE PROJECTS, FY 72,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.

A. L. Alford.
Copy available from GPO Sup Doc as EPL23:660/2-73-013, \$0.85; microfiche from NTIS as PB-228 147, \$1.45. Environmental Protection

Technology Series Report, EPA-660/2-73-013, September 1973. 46 p, 14 fig, 7 tab. EPA Project 16020 GHZ.

Descriptors: *Water pollution sources, *Pollutant identification, *Analytical techniques, Industrial wastes, Mine wastes, gas chromatography, Mass spectrometry, Polarographic analysis, Neutron activation analysis, Metals, Polychlorinated biphenyls, *Measurement, Instrumentation, *Waste identification, Organoleptic properties.

Identifiers: Atomic absorption spectrophotometry, Infrared spectroscopy, Ultraviolet spectroscopy.

Identification and measurement of aquatic pollutants are discussed under 13 project categories. In most cases these analyses helped to solve, or at least to understand more clearly, the related pollution incident and in some cases provided evidence for enforcement of regulatory legislation. These projects illustrate the need for many different analytical techniques to identify pollution sources. Continued development of new methods and improvement of existing techniques are required. (EPA)
W74-04197

THE EFFECT OF THERMAL ACCLIMATION ON HEART RATE AND OXYGEN CONSUMPTION OF FROGS DURING SUBMERGENCE,
British Columbia Univ., Vancouver. Dept. of Zoology.

D. R. Jones.
Comparative Biochemistry and Physiology, Vol 41A, No 1, p 97-104, 1972. 3 fig, 22 ref.

Descriptors: *Oxygen requirement, *Temperature, *Frogs, *Respiration, Bioassay, *Water temperature, Laboratory tests, Biology.
Identifiers: Acclimation.

Studies of *Rana pipiens* yielded the following results: Heart rate of warm (25C) acclimated frogs fell to a lower level (40 per cent of pre-dive value) than that of cold (5C) acclimated frogs (55 per cent of surface value) following submergence for 1 hr in open tanks at the same intermediate temperature (15C). In the respirometer the 5C acclimated group showed a reduction in oxygen consumption to 70 per cent and heart rate to 82 per cent of the surface values. In the 25C acclimated population both oxygen consumption and heart rate fell to about 55 per cent of the pre-dive level. A comparison of differences in winter and summer animals with differences in warm and cold-acclimated animals indicates that there is more to seasonal variation than mere acclimation to different temperatures. (Oleszkiewicz-Vanderbilt)
W74-04242

INVESTIGATION OF THE MICROFLORA OF SWAMP ORE AND LAKE WATER BY THE METHOD OF ELECTRON MICROSCOPY, (IN RUSSIAN),

Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
G. Dubinina, and Z. Derjagina.

Arch Hydrobiol. Vol 71, No 1, p 90-102. 1972. Illus. (English summary).

Identifiers: Bacteria, *Electron microscopy, *Flora, *Iron bacteria, Lakes, *Microorganisms, Morphology, *Swamp ore, Pollutant identification.

Electron and optical microscopy were used to investigate samples of swamp ore from 2 types of swamps and lacustrine freshwater. By electron microscopy a large number of small forms of iron bacteria and a number of interesting forms of microorganisms were revealed and some morphological details were clarified.—Copyright 1973, Biological Abstracts, Inc.
W74-04292

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

SPECTROPHOTOMETRIC DETERMINATION OF HEXACHLOROBUTADIENE (HCBD) IN SOIL AND WATER, (IN RUSSIAN),
Akademiya Nauk Moldavskoi SSR, Kishinev.
For primary bibliographic entry see Field 5B.
W74-04293

PRELIMINARY DATA ABOUT THE SEASONAL CHANGES AND VERTICAL STRATIFICATION OF PERIPHYTON FROM THE MIDDLE REACH OF THE RIVER DANUBE,
Slovenske Polohospodarske Akademie, Bratislava (Czechoslovakia). Laboratorium Rybarstva.
M. Ertlik, S. Juris, and J. Tomajka.
Arch Hydrobiol Suppl. Vol 44, No 1, p 35-48. 1972. Illus. (English summary).
Identifiers: Algae, Chlorophyll, *Danube River, Littoral zone, *Periphyton, Rivers, *Seasonal, Standing crop, *Stratification(Vertical), Aquatic animals.

The standing crop, chlorophyll a values and species composition of the algae and animals growing on artificial substrates (glass slides with rough surface) in the littoral zone of the river Danube were studied during the course of 1 yr. The artificial substrates were placed at different depths of the littoral zone, which was 6-7 m broad. The growth of the periphyton was limited by the frequent water-level fluctuations and by scouring during the flood. The highest values of the standing crop, as well as the chlorophyll a concentrations, were recorded during the autumn when the water level was relatively constant. The standing crop of algae decreased rapidly with increasing depth, whereas the standing crop of consumers showed a slowly increasing trend. At a depth of about 2.5 m the leveling up of both components was reached.—Copyright 1973, Biological Abstracts, Inc.
W74-04294

DETERMINING THE CATION CAPACITY OF HUMIC SUBSTANCES USING FLAME PHOTOMETRY, (IN ESTONIAN),
Akademiya Nauk Estonkoi SSR, Tartu. Inst. of Zoology and Botany.
U. Myal'gi.
Eesti Nsv Tead Akad Toim Biol. Vol 20, No 4, p 353-354. 1971.
Identifiers: *Cation capacity, *Flame photometry, *Humic acids, *Fulvic acids, *Alkali metals, Nitrogen, Phosphorus, Pollutant identification.

Cation capacity of humic and fulvic acids was determined by their content of alkali metals. This method was especially useful for the simultaneous determination of the general N and P content in the same water sample.—Copyright 1973, Biological Abstracts, Inc.
W74-04298

DETERMINATION OF CATION CAPACITY OF HUMIC ACIDS BY THIN ASH CONTENT, (IN ESTONIAN),
Akademiya Nauk Estonkoi SSR, Tartu. Inst. of Zoology and Biology.
U. Myal'gi.
Eesti Nsv Tead Akad Toim Biol. Vol 20, No 4, p 355-356. 1971.
Identifiers: Acids, *Ash, *Cation capacity, *Humic acids, *Pollutant identification.

Humic acid cation capacity calculated by the ash content can be used for a comparative analysis of humic substances in various bodies of water.—Copyright 1973, Biological Abstracts, Inc.
W74-04299

5B. Sources Of Pollution

EFFECT OF POLYESTER FIBER PROCESSING EFFLUENTS ON WATER QUALITY,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5A.
W74-03761

PRECIPITATION AS A NUTRIENT AND HYDROGEN ION SOURCE FOR FORESTED WATERSHEDS IN THE MISSOULA VICINITY,
Montana Univ., Missoula. School of Forestry.
L. K. Fercier, G. M. Knudsen, and F. H. Omodt.
Availability from NTIS as PB-227 249 \$3.25 in paper copy, \$1.45 in microfiche. Montana University Joint Water Resources Research Center, Montana State University, Bozeman, Report No 46, December 1973. 34 p, 9 fig, 2 tab, 33 ref. OWRR A-066 MONT(1).

Descriptors: Air environment, *Path of pollutants, Rain gages, *Precipitation(Atmospheric), *Air pollution, *Montana, *Nutrients, Ecosystems, *Forest watersheds, Hydrogen ion concentration, Calcium, Magnesium, Sodium, Potassium.
Identifiers: Precipitation quality, *Missoula Valley(Mont).

The importance of precipitation-borne nutrients and the pH of precipitation to forested ecosystems is described. A sampling network consisting of ten monitoring stations was established in the vicinity of Missoula, Montana, each with two or more collection devices, in the urbanized-industrialized Missoula Valley. Stations were directly downwind from Missoula, in a generally downwind valley, at a downwind intensive eco-system study site, and at an upwind control site. Weekly precipitation samples were collected at most sites, for a period of one year. Results show that bulk precipitation quality (as measured by Ca++, Mg++, Na+, and K+ concentrations) varies spatially as well as with respect to time. Preliminary analysis reveals several trends in the cation data. Concentrations recorded in the Missoula Valley are generally higher than those at the other stations. Additionally, the augmented concentrations appear to decrease rapidly outside Missoula, perhaps remaining higher in the downwind valley for a greater distance than in the direct downwind direction. (Williams-Montana)
W74-03766

THE CHEMISTRY OF CADMIUM IN NATURAL WATER-I: A STUDY OF CADMIUM COMPLEX FORMATION USING THE CADMIUM SPECIFIC-ION ELECTRODE,
Water Pollution Research Lab., Stevenage (England).
J. Gardiner.
Water Research, Vol 8, No 1, p 23-30, January 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Water chemistry, *Chelation, *Cadmium, Heavy metals, Poisons, Toxicity, Path of pollutants, Polyelectrolytes, *Water pollution sources.
Identifiers: Complex ions.

The extent of formation of labile complexes of cadmium was investigated in synthetic solutions and in samples of natural waters. A substantial proportion of the total cadmium in river and lake water is usually present as the free cadmium ion, and this proportion is larger at low pH values and at low proportions of sewage effluent present in the water. Humic substances usually account for most of the complexation, followed in importance by carbonate. (Knapp-USGS)
W74-03775

THE EFFECTS OF ARTIFICIAL SUNLIGHT UPON FLOATING OILS,
Chelsea Coll. of Science and Technology, London (England). Dept. of Pharmacy.
A. E. Klein, and N. Pilpel.
Water Research, Vol 8, No 1, p 79-83, January 1974. 5 fig, 3 tab, 14 ref.

Descriptors: *Oil spills, *Oxidation, *Water pollution control, Organic compounds, Degradation(Decomposition), Oil pollution.

Samples of hexadecane (of a low boiling fraction from a Tijuana crude oil and of high boiling fractions from the Tijuana, a Peruvian and a Libyan Amra crude oil) were irradiated while floating on water with ultraviolet light from a mercury arc. Under these conditions the oils are photo-oxidized and changes occur in their spreading properties and their solubilities in the water. The results are markedly affected by adding to the samples small amounts of naphthal, which acts as a photosensitizing agent. The naphthal increases the solubility of the Peruvian residue and causes a lens of it to spread instead of to contract during irradiation. Photosensitizing agents might be used in practice to accelerate the oxidation of oils by sunlight in the event of spills at sea. (Knapp-USGS)
W74-03777

SELF-DIFFUSION COEFFICIENTS OF SELECTED HERBICIDES IN WATER AND ESTIMATES OF THEIR TRANSMISSION FACTORS IN SOIL,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
H. D. Scott, and R. E. Phillips.
Soil Science Society of America Proceedings, Vol 37, No 6, p 965-967, November-December 1973. 1 tab, 11 ref.

Descriptors: *Diffusion, *Diffusivity, *Herbicides, *Mass transfer, *Soil water movement, *Path of pollutant, Ion exchange, Aqueous solutions.

Self-diffusion coefficients of selected herbicides were measured in aqueous solution by the capillary tube method. The diffusion coefficients were approximately 0.000006 sq cm per sec at 23 deg C and were not particularly related to the configuration of the herbicide molecule. Values calculated for the transmission factors of these herbicides differed; the more mobile compounds were associated with the higher values. (Knapp-USGS)
W74-03778

THE SIMULTANEOUS EFFECT OF PH AND CHLORIDE CONCENTRATIONS UPON MERCURY (II) AS A POLLUTANT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
H. C. H. Hahne, and W. Kroontje.
Soil Science Society of America Proceedings, Vol 37, No 6, p 838-843, November-December 1973. 8 fig, 2 tab, 25 ref.

Descriptors: *Mercury, *Path of pollutants, *Hydrolysis, *Soil water, *Hydrogen ion concentration, *Chlorides, Water chemistry, Water pollution, Heavy metals, Soil moisture, Clay minerals, Adsorption.

The mercuric ion, compared to other heavy metal pollutants, hydrolyzes at low pH values and forms soluble chloride complexes at low chloride concentrations. To evaluate the possible implications of such behavior in natural aquatic systems, Hg(II) hydroxy and chloride species distributions were calculated using pH and chloride ion concentrations as variables simultaneously. Range in pH values selected was from 2 to 9 to cover conditions encountered in acid mine drainages, rivers, all types of soil solution extracts, and seawater. In addition, montmorillonite, illite, and kaolinite were equilibrated with different HgCl₂ solutions. The

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range of HgCl_2 concentrations in equilibrium solutions was 0.000125M to 0.005M. Chloride complexes compete effectively with the hydroxy complexes of $\text{Hg}^{(II)}$. The chloride and hydroxy complexes may contribute appreciably to the mobilization of $\text{Hg}^{(II)}$. The mobility of $\text{Hg}^{(II)}$ hydroxide is limited by the intrinsic solubility of Hg(OH)_2 . At pH 4 and 5, chloride ion concentrations of 3.5 and 14 ppm, respectively, are sufficient for all $\text{Hg}^{(II)}$ to be in the HgCl_2 form. At higher pH values, partial to complete mobilization is possible depending on the prevailing chloride and $\text{Hg}^{(II)}$ concentrations. Little or no $\text{Hg}^{(II)}$ was adsorbed. The chloride ion concentrations of the equilibrium solutions varied between 1.4 and 14 ppm and pH values ranged from 3.68 to 4.90. (Knapp-USGS) W74-03782

NATURAL MIXING PROCESSES IN RIVERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.

W. W. Sayre.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 6, p 6-1--6-37, 1973, 9 fig, 39 ref.

Descriptors: *Mixing, *Path of pollutants, *Streamflow, Rivers, Hydraulics, Dispersion, Diffusion, Turbulent flow, Water quality.

The mechanisms which produce natural mixing in rivers are an important part of the overall transport process for waterborne substances, and therefore of river ecology. Starting with the fundamental three-dimensional convection-diffusion equation, and proceeding on to more tractable mathematical models of longitudinal dispersion, and transverse and vertical mixing, current methods for predicting mixing in rivers are reviewed. Accurate and detailed predictions of mixing are possible for the idealized case of uniform flow in a straight channel of constant cross section wherein the transport properties of the dispersing substance are the same as those of the ambient stream water. In rivers, where conditions of uniform flow in a straight channel of constant cross section are rarely more than roughly approximated, the mixing process is fairly well understood from a qualitative point of view. Because of the wide variety of channel characteristics which exist not only between rivers, but also along the course of any given river, detailed predictions for individual reaches have to be treated (although within the framework of a common mathematical model) as special cases, with some reliance on field measurements of velocity distributions and mixing coefficients. (Knapp-USGS) W74-03790

MECHANICS OF HEAT TRANSFER IN NON-STRATIFIED OPEN-CHANNEL FLOWS,
Geological Survey, Bay St. Louis, Miss.

H. E. Jobson, and N. Yotsukura.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 8, p 8-1--8-67, 1973, 14 fig, 776 ref.

Descriptors: *Thermal pollution, *Path of pollutants, *Mixing, *Heat transfer, Equations, Cooling, Cooling water, Thermal powerplants, Winds, Evaporation.

The power generation industry is the dominant producer of waste heat. Natural flowing water will always be the most efficient means of dissipating excess heat. The three-dimensional problem was formulated for an open channel flow with uniform depth by writing the conservation equation for thermal energy in terms of turbulent convection and diffusion and by describing the surface transfer as a boundary condition. The two-dimensional equation was then derived by integrating the three-dimensional equation with respect to depth.

The surface and hydraulic transfer mechanisms may be combined into one equation without the necessity of assuming a uniform water temperature. Finally the one-dimensional equation was developed by integrating the two-dimensional equation with respect to the width. The one-, two-, and three-dimensional equations are very much similar to, and no easier to solve than, the classical Fickian diffusion equation. However, in the present derivations the water temperature and velocity are not assumed to be uniform in the cross section. For the prediction of natural temperature distributions, as well as excess temperatures in the far field, the one-dimensional equation provides an adequate model. The one-dimensional thermal equation has the same form as the biochemical oxygen demand (BOD) equation. If the depth and velocity are independent of the longitudinal coordinate the equation can be integrated directly. Furthermore, if the excess temperature is needed the equation simplifies to the classical exponential dieaway curve. Excess temperature distributions can be predicted on the basis of wind speed information along, providing that the approximate natural temperature is used as a reference temperature. (Knapp-USGS) W74-03792

SOME EFFECTS OF WASTES ON NATURAL WATERS,

Vanderbilt Univ., Nashville, Tenn.

P. A. Krenkel.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 9, p 9-1--9-41, 1973, 6 fig, 1 tab, 16 ref.

Descriptors: Water pollution, *Water pollution control, *Path of pollutants, Hydraulics, *Waste assimilative capacity, Environment, Thermal pollution, Eutrophication, Mercury.

The problems of water pollution are reviewed briefly and implications with regards to the environment are discussed. A simplified methodology for the determination of the ability of a river to accept organic waste materials is presented. In order to determine the ability of a river to satisfactorily accept a waste discharge, hydraulic and hydrologic parameters that must be delineated include the hydraulic geometry, flow characteristics, the meteorologic characteristics, the detention times, the turbulence characteristics and the drought-frequency analysis. In addition, disposal of waste materials into other water bodies requires special expertise in the hydromechanics of estuaries, lakes and groundwater. (Knapp-USGS) W74-03793

HEATED SURFACE DISCHARGES INTO FLOWING AMBIENT STREAMS AND LAKES,

Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.

For primary bibliographic entry see Field 5D.

W74-03794

AGRICULTURAL IMPACT ON WATER QUALITY IN WESTERN RIVERS,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.

G. V. Skogerboe.

In: Environmental Impact on Rivers (River Mechanics II), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 12, p 12-1--12-25, 1973, 5 fig, 1 tab, 15 ref.

Descriptors: *Water pollution sources, *Irrigation, *Return flow, Water pollution effects, Water quality, Path of pollutants, *Salinity, Nutrients, Water pollution control, Pesticides, *Nitrates.

The practice of irrigation has detrimental effects on environmental water quality. Usually, the

quality of water draining from irrigated areas is materially degraded in several ways as compared with the water applied. Irrigation can also produce beneficial water quality effects through denitrification, phosphate reduction in subsurface return flows, and biological improvements. Irrigation return flows are of special concern because irrigated agriculture is the largest consumer of water resources. Throughout the world, a third of the irrigated land is plagued by salt problems. The major water quality problem resulting from irrigated agriculture is the salt transported to groundwater reservoir and rivers by irrigation return flow. Other problems include the movement of sediments, variable amounts of fertilizers and pesticides, phosphates (which may come from fertilizers), and increased bacterial content in surface return flows. Subsurface return flows frequently show considerable increase in salts, including nitrates, but show a reduction in bacteria. (Knapp-USGS) W74-03796

DISPERSION OF CONTAMINANTS ATTACHED TO SEDIMENT BED LOAD,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

H. W. Shen, and H-F Cheong.

In: Environmental Impact on Rivers (River Mechanics, III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 13, p 13-1--13-48, 1973, 20 fig, 2 tab, 6 ref.

Descriptors: *Path of pollutants, *Bed load, *Dispersion, *Sediment transport, Radioactive wastes, Stochastic processes, Statistics, Statistical methods, Alluvial channels.

Contaminants such as herbicides, pesticides, and radioisotopes can attach to sediment particles and move as bed load in a flow. Unlike those contaminants which are dissolved in the flow and moved rapidly by the flow velocity, these bed load particles with contaminants attached are dispersed rather slowly and can be a health hazard. Stochastic models describe the unidirectional movement of a sediment particle which advances in a series of alternate rest and transport periods. Current theoretical and experimental evidence indicate that the step lengths are gamma distributed with the shape parameter varying between one and three, and the rest periods are exponentially distributed. The dispersions of contaminated particles released instantaneously and continuously from a line source in the bed of a straight channel with steady, uniform flow were analyzed. The concentration distribution function is initially highly skewed and becomes progressively symmetrical with time. After a long dispersion time, the peak varies as the inverse square foot of the time. The location of the peak advances slightly faster than the mass center and they are almost coincident after a long time has elapsed. A simplified procedure of approximating the envelope of the family of distribution curves for a specified run yields a curve that is uniformly lower than the envelope. With an instantaneous introduction of contaminants, the time concentration distributions are highly skewed near the source and become progressively more symmetrical far downstream where they can be approximately represented by a Gaussian curve. With radioactive contaminants, the absorption rate is given by the inverse square law. (Knapp-USGS) W74-03797

CHEMICAL AND BIOLOGICAL SURVEY OF THE SAVANNAH RIVER ADJACENT TO ELBA ISLAND,

Skidaway Inst. of Oceanography, Savannah, Ga.

R. R. Stickney, and D. Miller.

Georgia Marine Science Center Technical Report Series No 73-3, February 1973. 68 p, 26 fig, 13 tab, 5 ref.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

Descriptors: *Baseline studies, *Water quality, *Natural gas, *Water temperature, *Georgia, Rivers, Water pollution control, Oil industry, Cooling water, Return flow, Environmental effects, Ecology, Ecosystems, Aquatic life, Data collections, Tidal effects, Water pollution sources.
Identifiers: Savannah River(Ga).

This study was supported by a grant from the Southern Natural Gas Company which plans to construct a regassification plant on Elba Island, Georgia, in the Savannah River where liquified natural gas (LNG) will be off-loaded from ships, regassified and piped to distribution centers. The initial plan called for water from the Savannah River to be pumped into the plant where it would be used to carry away the thermal debt incurred in converting the LNG from the liquid to the gaseous state. The process water, when returned to the river, was expected to be cooled approximately 5 deg F below ambient river temperature. No other changes in or additives to the process water were contemplated. Information is presented on the basic water chemistry and faunal assemblages in the river adjacent to Elba Island prior to construction of the plant. The study is intended to provide a data base for the water quality and biota in this section of the river under presently existing conditions of pollution from domestic, municipal and industrial sources against which any environmental effects of the regassification operation may be measured in the future. (Woodard-USGS)
W74-03804

WATER RESOURCES MONITORING AND EVALUATION—A KEY TO ENVIRONMENTAL PROTECTION IN ALABAMA OIL FIELDS,
Geological Survey, Tuscaloosa, Ala.
W. J. Powell, M. E. Davis, B. L. Bailey, and E. R. German.
Alabama Geological Survey Information Series 44, 1973. 82 p, 29 fig, 6 tab, 3 ref.

Descriptors: *Water pollution sources, Oil industry, *Monitoring, *Water quality, *Alabama, Surface waters, Groundwater, Control systems, Data collections, Water pollution control, Oily water, Chemical analysis, *Oil fields, *Oil pollution.

A monitoring program is being maintained in all principal oil fields in Alabama. The purpose of the monitoring program is to maintain surveillance on the chemical character of groundwater and surface water in the vicinity of the principal oil fields. This program is the first of its kind in the nation, and the results to date have been beneficial in early detection of areas of possible pollution. Emphasis is on significance of changes in quality of water in the Pollard, Citronelle, Gilbertown, and South Carlton oil fields. (Woodard-USGS)
W74-03807

SELENIUM IN NEBRASKA'S GROUNDWATER AND STREAMS,
Geological Survey, Lincoln, Nebr.
R. A. Engberg.
Nebraska Water Survey Paper No 35, December 1973. 42 p, 7 fig, 2 tab, 17 ref.

Descriptors: *Water pollution sources, *Trace elements, *Water chemistry, *Water analysis, *Nebraska, Sampling, Surface waters, Groundwater, Chemical analysis, Analytical techniques, Data collections, Public health, Water quality standards, Water quality control.
Identifiers: *Selenium.

Selenium is poisonous to animals and can be fatal if ingested in large amounts. It also is an essential micronutrient for good health. The U.S. Public Health Service recommended maximum permissible concentrations of 10 micrograms per liter of selenium of public water supplies. Selenium content was determined from 139 groundwater sites and 39 surface-water sites in Nebraska. Most of

the samples were obtained from known seleniferous areas. Measurable selenium concentrations were detected in water from some areas not previously suspected to be seleniferous. Concentrations greater than 10 micrograms per liter were found in 40.3% of all groundwater samples analyzed. At two locations, selenium concentrations in groundwater were significantly high—103 micrograms per liter from a well in northern Phelps County were high concentrations had not been expected and as high as 480 micrograms per liter in eastern Boyd County were high concentrations had been anticipated because the shale bedrock is known to be seleniferous. The highest observed concentration of selenium in surface water was 20 micrograms per liter at two widely separated locations. (Woodard-USGS)
W74-03813

THE HYDRAULICS OF ARTIFICIAL RECHARGE,
Technische Hogeschool, Delft (Netherlands).
For primary bibliographic entry see Field 4B.
W74-03820

BOREHOLE RECHARGE: THE COMPATABILITY OF RECHARGE WATER WITH THE AQUIFER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-03822

CLOGGING IN RECHARGE WELLS, CAUSES AND CURES,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4B.
W74-03824

TREATMENT OF OILY AND METAL-CONTAINING WASTEWATER,
Weston (Roy F.), Inc., West Chester, Pa.
Y. H. Lin, and J. R. Lawson.
Pollution Engineering, Vol 5, No 11, p 45-48, November 1973. 4 tab.

Descriptors: *Waste water(Pollution), Properties, *Oil wastes, *Industrial wastes, *Water pollution sources, Liquid wastes, Effluents, Chemical wastes, Oily water, Ion exchange, Oxidation, Reverse osmosis, Sedimentation, Emulsions, Oil, Biochemical oxygen demand, Diary industry, Chemical oxygen demand, Suspended solids, Phenols, Ammonia, Activated sludge, Chromium, Heavy metals, Iron, Copper, Cadmium, Zinc, Molybdenum, Nickel.
Identifiers: *Metal wastes, Silver, Cyanides, Textile industry, Petroleum refineries, Electroplating wastes, Arsenic, Barium, Selenium, Steel industry, Vegetable oil, Air flotation, Aircraft manufacturing industry, Shipbuilding industry, Automobile industry, Bilge water, Ballast water.

Data are presented in a tabular form which cover the major sources of oily and metal-containing wastes, characteristics of selected industrial wastewater, and effluent concentrations after various methods of waste treatment. (Holman-Battelle)
W74-03852

CHANGES IN CHEMICAL COMPOSITION AND PHYSICAL PROPERTIES OF A HEAVY RESIDUAL OIL WEATHERING UNDER NATURAL CONDITIONS,
Nova Scotia Technical Coll., Halifax.
O. J. Betancourt, and A. Y. McLean.
Journal of the Institute of Petroleum, Vol 59, No 569, p 223-230, September 1973. 5 fig, 2 tab, 10 ref, append.

Descriptors: *Oil pollution, *Weathering, *Oil spills, *Degradation(Decomposition), *Canada, Density, Viscosity, Nickel, Sulfur, Time, Heavy metals, Sampling, Analytical techniques, Aging(Physical).

Identifiers: *Chedabucto Bay(Nova Scotia), Asphaltenes, Vanadium, Bunker C oil, Fate of pollutants.

An oil spill from the tanker Arrow in Chedabucto Bay, Nova Scotia, in 1970 provided an opportunity to study changes in properties of oil over a 2-year period subsequent to the spill. The indicators of weathering used were viscosity, density, asphaltene content, and the concentration of nickel, vanadium, and sulfur. The main conclusions were: (1) The ratio of the concentrations of vanadium and nickel in an oil sample appears to be unaffected by the age of the sample. (2) Compounds containing vanadium and nickel in the fuel oil studied do not appear to be affected by weathering to any significant extent. (3) The composition of residual fuel oil is altered on weathering by evaporation and other processes, possibly biodegradation and solution. (4) The effect of the weathering processes is not great in terms of total loss of material and was less than 20 per cent after 18 months. (5) The rate of weathering is rapid, although erratic, in the early months after a spill. After approximately one year the rate of change is much reduced suggesting that the oil on the shore will remain for several years unless removed by mechanical means. (6) Asphaltene concentration rises as the result of weathering processes. This is associated with a corresponding rise in viscosity which suggests that if asphaltene concentration could be increased artificially, the movement of shore bound oil could be restricted. (Mortland-Battelle)
W74-03877

MIXED CULTURE BIOOXIDATION OF PHENOL. I. DETERMINATION OF KINETIC PARAMETERS,
State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5C.
W74-03879

MIXED CULTURE BIOOXIDATION OF PHENOL. II. STEADY STATE EXPERIMENTS IN CONTINUOUS CULTURE,
State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5C.
W74-03880

THE CHARACTERIZATION AND INFLUENCE OF DOMESTIC DRAIN EFFLUENTS ON THE RED CEDAR RIVER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. R. Talsma.

Available from the National Technical Information Service as PB-227 664: \$9.75 in paper copy. M.S. Thesis, 1972. 119 p, 17 fig, 13 tab, 61 ref, 4 append. OWRR C-3381(3023)(6). 14-31-0001-3723.

Descriptors: Alkalinity, Hardness(Water), Chlorides, Detergents, Phosphorus, Nitrogen, Ammonia, Dissolved solids, Temperature, Fluorescent dye, Bioassay, Effluents, *Monitoring, Hydrogen ion concentration, *Michigan, Benthic fauna, *Storm drains, Dissolved oxygen, Carbon, Conductivity, *Domestic wastes.

Identifiers: *Red Cedar River(Mich), Pollution monitoring, Ammonia-nitrogen.

A study was undertaken to monitor pollutants entering the Red Cedar River of central Michigan, and to determine their effects on the ecosystem. Dissolved oxygen, conductivity, phosphorus, nitrogen, carbon, suspended solids, chlorides and

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detergents were among the chemical parameters considered. Bioassays, live cars, bottom fauna and coliform analyses were the biological aspects of interest. Analyses indicated that pollutants were principally of domestic origin, coming from storm drains and combined storm and sanitary drains. Significant differences were found in water quality and river fauna above sources of pollution as compared with below sources. Most parameters showed little or no improvement since 1964.

W74-03895

NITRATE LEACHING IN SOIL ON RUTGERS AGRICULTURAL RESEARCH CENTER AT ADELPHIA, NEW JERSEY,

Rutgers - The State Univ., New Brunswick, N.J.
Dept. of Soils and Crops.
O. J. Gillings.

Available from the National Technical Information Service as PB-227 610; \$9.25 in paper copy, \$1.45 in microfiche. M.S. Thesis, January 1973. 117 p., 38 fig., 27 tab., 45 ref. OWRR A-027-NJ(3). 14-01-0001-3030.

Descriptors: *Fertilizers, Groundwater, Runoff, *Nitrates, *Leaching, Nitrites, *Nitrogen compounds, Water pollution sources, Ammonia, *New Jersey, *Soil water, *Path of pollutants.

An experiment was designed to find out if under normal agricultural practices, nitrogen fertilizers may pollute water. Nitrogen fertilizers, in the form of nitrate or ammonium, were applied to field plots and sorghum and beets grown. Suction lysimeters were used to sample soil water at the one, four and nine foot depths and surface runoff was sampled. Nitrate, nitrite, and ammonium were determined in these samples. More nitrogen was lost to both surface runoff and deep leaching from broadcast fertilizers than from drilled fertilizers. Little difference in the levels of nitrogen (nitrate plus ammonium) in soil water was found between nitrate and ammonium fertilizers. The largest deep leaching of nitrates occurred in the fall and in the spring. The amount leached was proportional to the amount of nitrogen applied. When 175 kg. N/ha was applied, the average (of three replications) amount of nitrate found in soil water at the nine foot depth was six to nine ppm. nitrogen. At the four foot depth nitrate nitrogen varied from one to nine ppm. nitrogen when treatment ranged from no nitrogen to 175 kg. N/ha. (Douglas-New Jersey)

W74-03897

MERCURY: UPTAKE BY THE GOLDFISH, CARASSIUS AURATUS, FROM LOW CONCENTRATIONS IN WATER AND ITS TISSUE DISTRIBUTION,

New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.

For primary bibliographic entry see Field 5C.

W74-03898

A COMPARISON OF INVERTEBRATE DRIFT IN THREE MICHIGAN STREAMS,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

L. D. Eyman.

Available from the National Technical Information Service as PB-228 145; \$5.75 in paper copy, \$1.45 in microfiche. M.S. Thesis, 1969. 44 p., 8 fig., 4 tab., 24 ref. OWRR C-3381(3723)(3) and C-1663(3153)(3).

Descriptors: *Benthos, *Invertebrates, *Drift, *Littoral drift, *Bottom sampling, Standing crops, Velocity, *Michigan.

Identifiers: Jordan River(Mich), Au Sable River(Mich), Red Cedar River(Mich), Baetis spp, Simulium spp, Hyclella azteca.

The purpose was to measure the rate of drift in three contrasting streams and determine what relationship exists between drift rate and degree of enrichment.

Additionally an attempt was made to determine how drift is related to current velocity. The three streams were the Jordan River in Antwerp County, Au Sable River in Crawford County, and Red Cedar River in Ingham County. Two 24-hour series of drift samples were collected in each stream. Samples of benthic invertebrates were collected following each 24-hour drift collecting period. To investigate the relationship of current velocity to drift rate, five series of samples were collected along a transect across the stream at three points where the velocity was different. Although standing crop estimates did not reflect the degree of enrichment in the streams, total drift measurements showed a relationship to enrichment. The relationship between total drift and current velocity was linear, as expected. However, the drift rate of Baetis sp. and Simulium sp. appeared to be influenced by behavioral as well as physical factors and was therefore non-linear. Methods for sampling drift are discussed with suggestions for standardization of technique.

W74-03920

POTAMOLOGICAL EFFECTS OF FISH HATCHERY DISCHARGE ON THE JORDAN RIVER, NORTHERN LOWER MICHIGAN,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

For primary bibliographic entry see Field 5C.
W74-03930

THE DYNAMICS OF BROWN TROUT (SALMO TRUTTA) AND SCULPIN (COTTUS spp.) POPULATIONS AS INDICATORS OF EUTROPHICATION,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

For primary bibliographic entry see Field 5C.
W74-03940

RESIDUAL INFORMATION MODEL WITH APPLICATION TO HEAT FROM THERMAL POWER PLANTS,

Auburn Univ., Ala. Dept. of Economics.

M. M. Baker.

In: Social Accounting Approaches to Water Resource Use in Economic Development, Auburn Univ., Alabama, School of Business Research Series 3, p 41-89, August 1972. 15 fig., 33 ref.

Descriptors: *Model studies, *Wastes, *Costs, *Economics, *Thermal pollution, Pollutants, Attitudes, Decision making, Thermal powerplants, Beneficial use.

Identifiers: *Residual information model, Waste heat, Public response, Russell-Spoofford model, Thermal by-products.

Varying residual levels and forms result from alternative combinations of production, protection, and recipient reaction decisions. A Residual Information Model is developed from the Russell-Spoofford model and applied to the problem of residual heat created by steam electric plants. In production processes, technical and raw material choices using either fossil or nuclear fuel generate varying residuals including heat. While nuclear fuel is cheaper and produces less residuals other than heat, higher capital costs and heat residuals are created. Protection decisions include recycling, by-product production, and treatment of residuals before expelling them into the environment. While a number of by-products are explored, only heating and air conditioning are considered feasible. Four measures—once-through freshwater cooling, cooling pools, evaporating cooling towers, and non-evaporating cooling towers, ranking from cheapest to most expensive respectively—were considered. The environmental cost ranking is obtained by reversing the first and fourth alternatives. After treatment, the remaining residuals have varying effects on people, plants, animals, and inanimate objects through water condensation

and heat exchange in the air. Negative reactions to residual heat are revealed by increased monitoring, changes in plant location, and increased demand for regulation of power plants. (See also W74-03907) (Schroeder-Wisconsin)
W74-03911

POLLUTION OF DRINKING WATER BY OIL IN THE PIPES OF NEW BUILDINGS, (IN GERMAN),

Erlangen-Nuremberg Univ. (West Germany). Inst. for Hygiene and Medical Mikrobiology.

W. Graef, W. Knapp, and K. Wartenberg.

Zentralbl Bakteriol Parasitenk Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 5, p 350-359, 1972. Illus. (English summary).

Identifiers: Buildings, *Oil pollution, *Pipes, Pollution, *Potable water, Water pollution sources, Public health.

Non-canalized water can be polluted by mineral oils. Little attention has been given to and few complaints are heard about the pollution of household tap water through the use of prohibited mineral oils for cutting threads on pipes and joining them together. Four relevant cases are reported, in which a varying oil content and a penetrating, nauseous smell was found in samples of water taken after it had passed through the meter. Local investigations, the dismantling of water pipes and threaded unions and detailed chemical analysis proved that an oil containing organic sulfur compounds had been used for cutting threads and moistening hemp packings, and that its decomposition products had made the water unfit to drink. It was ascertained that, after complaints had come to their notice, the suppliers put a cutting lubricant of different composition on the market under the same brand name.—Copyright 1973, Biological Abstracts, Inc.

W74-03950

LOOKING FOR POLLUTION UNDER THE EARTH,

L. A. Purrett.

Science News, Vol 103, p 78, February 3, 1973. 1 photo.

Descriptors: *Water pollution, *Aquifers, *Fertilizer, *Soil tests, *Model studies, *California, Water table, Nitrates, Denitrification, Nitrogen, Irrigation, Aeration, Soil analysis, Water pollution control, Water quality.

Researchers at the University of California intend to drill holes at selected sites, and through soil analysis, will develop a computer model to predict how much pollution results from a given application of nitrogen fertilizer. Any nitrogen fertilizer can be oxidized under the right conditions to form nitrates, and the problem is compounded in California by the extensive use of irrigation, which can aggravate the nitrate pollution problems by washing the nitrates down to the water table. Factors such as the amount of nitrogen initially going into the soil, the amount of water applied, the permeability of the soil, the type of crop the fertilizer is applied to, the presence of organic matter which can reduce the nitrate and the aeration of the soil influence how much nitrate eventually reaches the water table. An analysis of these factors will enable the benefits of fertilizer use to be balanced against the hazards of soil and water pollution, which in turn will permit guidelines showing farmers how to increase food production without polluting water supplies. (Ritchie-Florida)
W74-04004

CATASTROPHE BREWING IN QUIET WATERS,

National Wildlife Federation, Washington, D.C. E. Chaney.

National Wildlife, Vol 9, p 4-7, August-September 1971. 1 photo.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

Descriptors: *Water, *Water pollution, *Mercury, *Water pollution sources, Public health, Toxicity, Pesticides, Industrial wastes, Dredging, Chemical wastes, Effluents, Mining, Water pollution effects, Fishkill, Mortality, Water quality, Heavy metals, Fish, Non-game birds, Mammals, Water birds, Wildlife.

Despite extensive government activity to halt its discharge, following discovery of high concentrations of mercury in fish from border waters, the mercury disaster still exists. Mercury has been found in fish, game birds, whales and seals, and environmental mercury contamination may be irreversible. While mercury comes in an incredible variety of compound forms, its major sources are natural geologic formations, industrial discharges, pesticides, mining residues, fossil fuel burning and miscellaneous garbage. Although the human body excretes mercury slowly, there is ample time for it to cause fatigue, lethargy and irritability as well as brain and genetic damage. A special federal task force concluded that even with complete, immediate elimination of discharges, existing deposits of mercury in sediments will continue to yield highly toxic methylmercury for decades. Alternatives proposed for removal of mercury deposits include covering the bottoms of contaminated waterways with absorptive materials like ground quartz or silicates, burying the bottoms under rocks, and removing the contaminated bottoms by dredging or pumping. (Ritchie-Florida) W74-04025

A BRIEF WATER-RESOURCES APPRAISAL OF THE TRUCKEE RIVER BASIN, WESTERN NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 4A.
W74-04047

EFFECTS ON WATER QUALITY IN THE SHALLOW AQUIFER DUE TO THE OPERATION OF THE CROSS STATE DUMP, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.

J. J. Schneider.
Open-file report 73011, 1973. 42 p, 11 fig, 3 tab, 1 ref.

Descriptors: *Water pollution sources, *Garbage dumps, *Water quality, *Groundwater, *Florida, Data collections, Chemical analysis, Water analysis, Water levels, Bacteria, Pesticides, Geology, Groundwater movement, Leachate, Ecology, Path of pollutants.
Identifiers: Palm Beach County(Fla).

Leachate from the Cross State Dump, Palm Beach County, Florida, has impaired the quality of the water at shallow depth in the aquifer in the immediate vicinity of the dump. The impairment has been minimal at producing wells a quarter mile south and east of the dump. The influence of the dump on the groundwater to the north and west could not be determined due to a natural decline of groundwater quality in these directions. The water table in the immediate dump area slopes downward in all directions towards the surrounding canals. The canals to the west, north, and east of the dump drain into the south canal which is the West Palm Beach Canal. There is no indication that the leachate has materially affected the water quality in the West Palm Beach Canal. The findings are based on information obtained from 22 wells and 10 canal sites from August 1970 through March 1972. (Woodard-USGS) W74-04052

NITROGEN AND PHOSPHORUS LOSSES IN SURFACE RUNOFF FROM AGRICULTURAL LAND AS INFLUENCED BY PLACEMENT OF BROADCAST FERTILIZER,
Agricultural Research Service, Morris, Minn.
North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 5C.

W74-04096

GENERALIZED SIMULATION MODELS FOR MASSACHUSETTS STREAMS,
Quirk, Lawler and Matusky Engineers, Tappan, N.Y.

H. H. Yeh, M. J. Skelly, and J. P. Lawler.
Journal of the Boston Society of Civil Engineers, Vol 60, No 3, p 107-132, July 1973. 7 fig, 5 tab, 10 ref.

Descriptors: *Water pollution control, *Simulation analysis, Streams, Rivers, *Massachusetts, *Water quality, *Computer models, Dissolved oxygen, Biochemical oxygen demand, Management, Planning, Dams, Systems analysis, *Waste assimilative capacity.
Identifiers: Streeter-Phelps equation, *Housatonic River Basin(Mass).

Presented is a generalized stream simulation model developed to provide the Division of Water Pollution Control of the Commonwealth of Massachusetts with the in-house capability to evaluate the assimilative capacities of Massachusetts' streams and rivers. Based on a modification of the Streeter-Phelps equation, the model can be used to predict BOD and DO profiles in a stream and to determine the fate of other pollutants. Moreover, it is useful in ascertaining the location of sampling stations and in planning waste treatment facilities. The generalized stream model stems from the basic concept that the BOD and DO profiles of a waterway can be generated by repeatedly solving BOD and DO models for a series of generalized reaches. This process is called the 'multiple-reach' technique. The model was verified with Housatonic River (Mass.) data and its generality is currently being tested in applications to other streams and rivers in the Commonwealth; nitrogenous oxidation and diurnal variation of photosynthesis are included in these studies. The results are reported as being very satisfactory. (Bell-Cornell)

W74-04118

MOVEMENT OF NITRATES UNDER IRRIGATED AGRICULTURE,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.

D. M. Edwards, P. E. Fischbach, and L. L. Young.
Transactions of the ASAE (American Society of Agricultural Engineers), p 73-75, 1972. 6 fig, 14 ref.

Descriptors: *Irrigation effects, *Soil water movement, *Fertilizers, *Water pollution sources, Chemical wastes, Nitrogen compounds, Soil amendments, Water pollution, Soil chemistry, Soil moisture, Water quality, Infiltration, Percolation, Subsurface flow, Unsaturated flow, *Path of pollutants.

Nitrate-nitrogen movement within runoff water was monitored under irrigation conditions. The placement of nitrogen-bearing fertilizers at various depths in the soil is examined with respect to the movement of the resultant nitrates in the unsaturated zone. Once nitrates move below the soil surface they do not re-enter the run-off water. Nitrates move essentially with the wetting front when the soil is initially dry. Nitrates do not move at the same rate as the water when the soil is initially saturated. A run-off water re-use system is required to prevent pollution of surface water if runoff occurs from an irrigated field when nitrogen fertilizer is injected into the influent water. With a properly designed and managed irrigation system little or no movement of nitrates outside the root zone should occur. (Muller-Arizona)

W74-04139

THE 'TENACIOUS' IRON BACTERIA,
Universal Oil Products, St. Paul, Minn. Johnson Div.
G. A. Stott.

Johnson Drillers Journal, p 4-6, July-August, 1973. 6 fig, 9 ref.

Descriptors: *Groundwater, *Wells, *Iron bacteria, Sphaerotilus, Aquatic bacteria, *Water treatment, *Chlorination, Chemical reactions, Acidity.

Identifiers: Siderocapsa, Gallionella, Crenothrix, Clonothrix, Leptothrix, *Acid treatment.

Iron bacteria are examined from the following standpoints: origin, presence in ground water, methods of classification, methods of identification, methods of sample collection, effects on wells and distribution systems, and methods of treatment. Iron bacteria include those that precipitate ferric hydroxide from solutions of ferrous bicarbonate, those that do not require ferrous bicarbonate for their vital processes, but that cause the deposition of ferric hydroxide when either inorganic or organic salts are present, and those that attack iron salts of organic acids. Plugging and decreased hydraulic efficiency result in well and distribution systems, and suggested treatment follows a three-step process of shock chlorination, acid treatment, and a final shock chlorination. (Campbell-NWWA)

W74-04143

EFFECTS OF DEICING CHEMICALS UPON GROUND AND SURFACE WATERS (INITIAL PROGRAM DEVELOPMENT),

Massachusetts Dept. of Public Works, Wellesley Hills. Research and Materials Section.

L. C. Stevens, Jr.

Journal of the New England Water Works Association, Vol 87, No 1, p 1-7, March, 1973.

Descriptors: *Water quality, Water pollution sources, Chemical wastes, Statistical methods, *Mathematical models, Groundwater movement, *Soil water movement, *Massachusetts.

Identifiers: *Deicing salts.

The Massachusetts Department of Public Works has been actively engaged in salt studies for approximately 10 years. Research reports and abstracts have been monitored throughout the whole field of deicing chemicals, to include studies on effective substitutions for sodium and calcium chloride and the effects of chlorides on the environment, plants and animals. Up till now there has been very little done, however, on the effect of deicing chemicals upon water quality. A new study to investigate the composition of water sources near roadsides as affected by deicing salts is envisioned. The research approach is two-fold. First is a statistical analysis of available data and second, controlled environmental experimentation with the objective to isolate and study the mechanics and transport of highway deicing chemicals. The transport mechanics are to be related to a variety of geologic, hydrologic and highway maintenance conditions with an overall goal to develop a predictive relationship in time and space. (Hunt-NWWA)

W74-04149

FARM GROUND WATER NITRATE POLLUTION - A CASE STUDY,
Illinois State Water Survey, Urbana.

W. H. Walker, T. R. Peck, and W. D. Lembecke.
Presented at American Society of Civil Engineers Annual and National Environmental Engineering Meeting, October 16-22, 1972, Houston, Texas. Preprint Number 1842, 29 p, 8 fig, 13 ref. \$0.50.

Descriptors: Water quality, *Water supply, Wells, Groundwater, Storm-runoff, *Groundwater movement, *Nitrates, Aquifer characteristics, *Illinois, *Farm wastes, *Water pollution sources.

Identifiers: Farm-supply wells, Chemical contamination, Pollutant migration.

Increases of nitrates (NO_3^-) in groundwater caused either directly or indirectly by man's activities

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

have been a special area of concern because of this chemical's suspected harm to children if concentrated in drinking water supplies in excess of 45 ppm NO₃. Many Illinois farm groundwater supply samples analyzed by Water Survey chemists contain from 100 to 1000 ppm, and one recent sample contained 6000 ppm nitrate. The primary sources of excessive nitrate in most affected groundwater supplies investigated has proved to be animal and human waste and nitrogen fertilizer. Nitrate is readily dissolved in precipitation which falls upon such areas and is carried by this water into surficial groundwater aquifers during the groundwater recharge periods of late fall and early spring. In Illinois, practically all recharge to groundwater reservoirs occurs during this part of the year. When the nitrate-rich recharge water enters an aquifer within the cone of influence of a pumping well, in time it will move through the aquifer to that well. In unpumped aquifers, the polluted water moves through the water-bearing material to some near subsurface drainage structure, and perhaps leaves the area undetected several days, months, or years after its initial entry into the aquifer. A detailed study of the nature of groundwater nitrate pollution from farm-derived sources that was begun in the summer of 1971 is presented. (Hunt-NWWA)
W74-04158

DISCHARGE AND FLOW DISTRIBUTION, COLUMBIA RIVER ESTUARY,
Geological Survey, Bay St. Louis, Miss.
G. A. Lutz, D. W. Hubbell, and H. H. Stevens, Jr.
Available from NTIS, Springfield, Va., as Rept. No. TID-26445. \$5.45 per copy, \$1.45 microfiche.
Report No. TID-26445, 1973. 79 p, 18 fig, 7 tab, 2 append.

Descriptors: *Columbia River, Water flow, River flow, *Estuary, *Flow measurement, *Discharge measurement, Dispersion, *Distribution, Nuclear powerplants, Effluents, Radioactivity, Waste disposal, Ion transport, Sediment, Biota, *Washington.
Identifiers: Richland(Wash).

Low-level radioactive wastes were discharged into the Columbia River at the Hanford Reservation, U.S. Atomic Energy Commission, near Richland, Washington, from the time of the initiation of nuclear-reactor operations in 1944 until early in 1971. The wastes resulted primarily from the neutron activation of chemical constituents in treated Columbia River water that was used to cool the nuclear reactors. Once the radionuclides were released to the river environment they remained in solution or became associated with sediment or stream biota. Although much of the radioactivity decayed, some radionuclides were transported by the associated media downstream and ultimately reached the Columbia River estuary and thence the Pacific Ocean. One of the purposes of this investigation was to define rates of transport of radionuclides at cross sections along the longitudinal axis of the estuary. The equipment and techniques are described that were used to obtain measurements of the flow, the mathematical models utilized to determine discharges at two different cross sections are discussed, discharge data are presented, and the nature of circulation patterns in the vicinity of Astoria, Oregon is discussed. (Houser-ORNL)
W74-04172

ENVIRONMENTAL SURVEILLANCE FOR RADIOACTIVITY IN THE VICINITY OF THE CRYSTAL RIVER NUCLEAR POWER PLANT: AN ECOLOGICAL APPROACH,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. E. Bolch, and J. C. Lochamy.
Progress Report, submitted to Florida Power Corp., St. Petersburg, Fla., Oct 1973. 39 p, 3 fig, 3 tab.

Descriptors: Surveys, *Florida, *Gulf of Mexico, *Radioactivity, *Aquatic life, Ecology, Ecosystems, Sampling, Data collections, Analytical techniques, Model studies, *Path of pollutants, Food chains, Public health, Water pollution sources.
Identifiers: *Surveillance program, Dose to man, *Crystal River(Fla).

This contract began in August of 1970 with a team of seven faculty members representing the departments of Environmental Engineering, Zoology, Nuclear Engineering, Radiation Biophysics, and Aquatic Sciences and six graduate students. The basic theme was to recognize that there were numerous and complex pathways by which radionuclides may cause exposure to plant life, animals and man, and to design the study with due regard to ecological principles. The specific objectives included baseline radioactivity measurements, pathway identification and description, method and procedure development, data analysis, public relations and training. In later contracts, model predictions of dose to man was added as a specific objective. Activities and data accomplished through about July 1, 1973 are presented. (Houser-ORNL)
W74-04173

INTERIM ENVIRONMENTAL MONITORING REPORT: JANUARY-JUNE 1973,
Mound Lab., Miamisburg, Ohio.
For primary bibliographic entry see Field 5A.
W74-04174

COMPARISON OF MEASURED AND CALCULATED RADIATION EXPOSURE FROM A BOILING WATER REACTOR PLUME,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
C. V. Gogolak.

Available from NTIS, Springfield, Va., as Rept. No. HASL-277, \$4.00 per copy, \$1.45 microfiche.
Report No. HASL-277, Sept 1973. 24 p, 6 fig, 8 tab, 10 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Gases, *Measurement, Assay, Radioactivity, Experimental models, Computer models, Evaluation, Performance, Meteorology, Radioisotopes, Economics, Comparative benefits, Model studies, Nuclear reactors.
Identifiers: *Plumes, *Boiling water reactor.

The availability of new techniques for measuring gamma-ray exposure in the vicinity of nuclear facilities has made possible a critical comparison of measured and calculated plume exposures. The results of such comparisons indicate that models based on the assumption of a Gaussian concentration distribution of radionuclides in the plume predict the gamma radiation exposure to better than a factor of two. The effect on the predicted exposure of approximating various input parameters and simplifying cloud integrations is often critically dependent on the particular radionuclides and meteorological conditions under consideration. Further work is planned on determining the behavior of plume exposure models under specific meteorological conditions for a larger volume of experimental comparisons, to more accurately establish the limits of error of the model calculations. The choice of model can then be made considering the degree of accuracy required and the cost of obtaining that accuracy in computer time. (Houser-ORNL)
W74-04175

ENVIRONMENTAL RADIOACTIVITY - ISPR 1971.
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
M. de Bortoli, and P. Gaglione.
Available from NTIS, Springfield, Va., as Rept. No. EUR-4944e. \$4.00 per copy, \$1.45 microfiche.

Report No. EUR-4944e, April 1973. 48 p, 11 fig, 24 tab, 6 ref.

Descriptors: *Monitoring, *Environment, *Radioactivity, *Assay, Measurement, Air pollution, Water pollution, Water pollution sources, Soil contamination, Fallout, Surface waters, Strontium, Cesium, Milk, Fish, Food chains, Public health, Dusts, Hydrogen ion concentration, Rain.
Identifiers: *Italy.

The 1971 activity is reported of the site survey group of the Protection Division at the Euratom Joint Research Centre - Ispra Establishment. The group works on the radiation protection of the population concerned by the radioactive effluents of the Establishment; during 1971 some measurements have been started on non-radioactive pollution also. Results are presented of the measurements carried out directly on the effluents as well as in the environment in order to assess the contribution by the Establishment to the population dose and the pre-existing radiation and contamination levels of natural origin and those due to worldwide fallout. The results of the determinations carried out in the field of non-radioactive pollution are also reported. Radioactivity in air, precipitation, surface and underground waters, and herbs are given. (Houser-ORNL)
W74-04176

DOSE ESTIMATIONS FOR THE HYPOTHETICAL USE OF NUCLEARLY STIMULATED NATURAL GAS IN THE CHEROKEE STEAM ELECTRIC STATION, DENVER, COLORADO,
Oak Ridge National Lab., Tenn.

R. E. Moore, and C. J. Barton.
Available from NTIS, Springfield, Va., as Report. No. ORNL-TM-4026. \$4.00 per copy, \$1.45 microfiche. Report No. ORNL-TM-4026, Oct 1973. 39 p, 3 fig, 5 tab, 19 ref, append.

Descriptors: *Tritium, Hydrogen, *Radioactivity, *Assay, Effluent, Nuclear powerplants, Population, Public health, Absorption, Toxicity, *Natural gas, *Colorado, Nuclear explosions, Underground secondary recovery(Oil), *Computer programs.
Identifiers: Denver(Colo).

Whole-body radiation doses to man due to tritium were estimated for hypothetical exposures to stack gases discharged from the Cherokee Steam Electric Station in the Denver area burning 94 million cubic feet per day of nuclearly stimulated natural gas containing 10 pCi per cu cm of tritium. The highest dose that might be received by any person outside the plant area was estimated to be 0.0056 millirem/year. This value includes 0.0047 millirem/year estimated by use of computer program, STACKDOSE 2, to result from the initial exposure to the plumes from the stacks. STACKDOSE 2 calculates the tritium concentration every 100 meters from the plant stacks in the predominant wind direction and the corresponding dose from inhalation and skin absorption of tritiated water vapor. It also identifies the location of maximum exposure. (Houser-ORNL)
W74-04177

HEALTH EFFECTS OF ELECTRICITY GENERATION FROM COAL, OIL, AND NUCLEAR FUEL,
Carnegie-Mellon Univ., Pittsburgh, Pa. Graduate School of Industrial Administration.
For primary bibliographic entry see Field 5C.
W74-04184

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE MONTICELLO NUCLEAR GENERATING PLANT, MONTICELLO, MINNESOTA, AUGUST 1970.
EG and G, Inc., Las Vegas, Nev.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

Available from NTIS, Springfield, Va., as Rept. No. ARMSI70-6-6, \$4.00 per copy, \$1.45 microfiche. Report No. ARMS-70-6-6, Sept. 1973. 18 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Surveys, *Radioactivity, *Mapping, Contours, *Remote sensing, *Air pollution, Water pollution sources, Radioisotopes, Nuclear powerplants, Effluents, Nuclear wastes, Food chains, Population, Public health, Mississippi River, Lakes, *Minnesota, Equipment, Instrumentation, Water pollution.

Identifiers: Monticello plant, Boiling water reactor, Gross gamma.

The Aerial Radiological Measuring Systems (ARMS) was used to survey the Monticello Nuclear Generating Plant and surrounding area during August 1970. The survey measured terrestrial background gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 625 square mile area showing isoexposure contours three feet above the ground. Results indicated the presence of isotopes normally found in the background radiation throughout the United States. (Houser-ORNL)

W74-04185

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING BIG ROCK POINT NUCLEAR PLANT, BIG ROCK POINT, MICHIGAN, 1968,

EG and G, Inc., Las Vegas, Nev.

M. D. Sevar.

Available from NTIS, Springfield, Va., as Report No. ARMS-68-6-3, \$4.00 per copy, \$1.45 microfiche. Report No. ARMS-68-6-3, Oct 1973. 40 p, 25 fig, 4 tab, 1 append.

Descriptors: *Surveys, *Radioactivity, *Mapping, Contours, *Remote sensing, *Air pollution, Water pollution, Water pollution sources, Radioisotopes, Nuclear powerplants, Effluents, Nuclear wastes, Food chains, Population, Public health, Instrumentation, *Lake Michigan, Equipment.

Identifiers: Big Rock Point Nuclear Plant.

The Aerial Radiological Measuring System (ARMS), operated for U.S. Atomic Energy Commission, was used to perform aerial surveys of several operational and non-operational reactor sites during the summer months of 1968. The data collected on these surveys included aerial photographs of the installations, aerial radiation survey data consisting of exposure rates normalized to 3 feet above the ground plus gamma-ray spectral charts, effluent characterization for operational sites (intensity rates and isotope constituents), and pertinent descriptive information of the installation. Data collected on the Big Rock Point reactor survey are presented. (Houser-ORNL)

W74-04186

UPTAKE AND TRANSLOCATION OF SR BY ZEA MAYS,

California Univ., Berkeley. Dept. of Soils and Plant Nutrition.

For primary bibliographic entry see Field 5C.

W74-04187

MANAGEMENT OF RADIOACTIVE AQUEOUS WASTES FROM AEC FUEL-REPROCESSING OPERATIONS,

Division of Production and Materials Management (AEC), Washington, D.C.

W. L. Lenneman.

Available from Supt. of Documents, Gov. Printing Office, Wash., D.C., \$1.85 per copy. Nuclear Safety, Vol 14, No 5, p 482-506, Sept-Oct, 1973. 20 fig, 7 tab, 13 ref.

Descriptors: *Nuclear wastes, Nuclear powerplants, Effluents, *Waste disposal, *Waste storage, *Waste treatment, Water pollution, Water pollution sources, Management, Regulation, Monitoring, Columbia River, Nevada, *Acidic water.

Identifiers: Fuel reprocessing, Savannah River(Geo), *Storage tanks.

Since 1944 the Atomic Energy Commission (and its predecessor, the Manhattan District) has been overseeing the management of radioactive wastes from its fuel-reprocessing plants which are contractor operated. Experience during the years has indicated that management of these radioactive wastes requires unrelenting evaluation and appraisal by higher management and management groups. Experience with leaking waste tanks at Hanford, Savannah River, and the National Reactor Testing Station to 1972 is summarized. Important related activities are periodic reviews, frequent analyses, and continuous planning. Guidance is provided for designers of fuel-reprocessing waste-management systems including such features as acid waste storage, double containment, protection against credible forces of nature, facilities for emptying waste-storage tanks, space and access for inspection, adequate radiation-monitoring devices connected to a central recording station, and segregation and diversion capability for discharged effluent aqueous streams. (Houser-ORNL)

W74-04188

DETERMINATION OF FALLOUT CS-137 AND NATURALLY OCCURRING GAMMA-RAY EMITTERS IN SEDIMENTS,

Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

J. C. Ritchie, and J. R. McHenry.

International Journal of Applied Radiation and Isotopes, Vol 24, No 10, p 575-578, Oct 1973. 2 fig, 1 tab, 5 ref.

Descriptors: Environment, *Radioactivity, *Radioisotopes, *Cesium, *Strontium, Uranium radioisotopes, Fallout, Water pollution, Deposition(Sediments), Surveys, Assay, Potassium, *Path of pollutants, *Sediments.

Identifiers: Thorium.

With the advent of the nuclear age, a number of radionuclides were introduced into man's natural radiation environment. Two of these radionuclides, cesium-137 and strontium-90, are of particular interest because of their long half lives and biological importance. Research is being conducted on the movement and redistribution of Cs-137 and the naturally occurring gamma-ray emitting radionuclides, thorium, uranium and potassium, in relation to cultural and erosional processes within watersheds. Methods used to determine Cs-137 and the naturally occurring gamma-ray emitters in sediments are described. (Houser-ORNL)

W74-04190

FLUX OF CE-141 THROUGH A EUPHAUSIID CRUSTACEAN,

International Lab. of Marine Radioactivity, Monte Carlo (Monaco).

For primary bibliographic entry see Field 5C.

W74-04191

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1970,

Battelle-Pacific Northwest Labs., Richland, Wash. Environmental Evaluations Section.

J. P. Corley.

Available from NTIS, Springfield, Va., as Report No. BNWL-1969, \$5.45 per copy, \$1.45 microfiche. Report No. BNWL-1669, Sept. 1973. 93 p, 16 fig, 22 tab, 29 ref, 5 append.

Descriptors: *Washington, *Columbia River, *Water pollution, *Water pollution sources, Nuclear powerplants, Effluents, Radioactivity, *Nuclear wastes, Waste disposal, Assay, Measurement, Radioisotopes, Population, Food chains, Public health.

Identifiers: Hanford site(Wash), *Surveillance.

Low-level wastes from Hanford operations, fallout from nuclear weapons testing, naturally-occurring radioelements, and cosmic radiation all contribute to radioactivity in the Hanford environs. The most significant Hanford contributions to off-plant radioactivity and consequent population doses have usually originated with reactor cooling water released to the Columbia River. The surveillance program included sampling and analysis on a routine basis of river water, municipal drinking water, groundwater, air, milk, foodstuffs, fish, shellfish, and gamebirds. Measurements were made of external gamma exposure rates at land stations, in the river, over the river surface, and along the river shoreline. Contamination surveys were made at selected ground plots and along public highways adjacent to the Hanford site. Columbia River water and Richland drinking water were routinely sampled for chemical and biological analysis, and air quality measurements were made at locations adjacent to the site boundaries. Shutdown in February 1970 of KW Reactor, one of the two remaining single-pass, river water-cooled production reactors, as well as an extended outage of all reactors, greatly reduced the major remaining source of population exposure from Hanford operations. In 1970, average river concentrations of radionuclides were less than 3% of the Concentration Guides, and transport rates of radionuclides in the river were much reduced from 1969. (Houser-ORNL)

W74-04192

INCREASING THE PROCESSING RATE OF PARTICULATE ORGANIC MATTER IN STREAMS,

Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.

K. W. Cummins.

Project Completion Report Institute of Water Research, Michigan State University, January 1974. 110 p. OWRR B-019-MICH (2). 14-31-0001-3597.

Descriptors: Streams, Ecosystems, *Detritus, *Leaves, *Litter, Benthos, *Organic matter, Management, Model studies, Digestion, Carbon dioxide.

Identifiers: Dissolved organic matter, Particulate organic matter, *Carbon dioxide conversion.

Based on a generalized conceptual (and partial mathematics) model of woodland stream ecosystem structure and function, factors effecting the rates of processing of dissolved organic matter (DOM) and particulate organic matter (POM) have been investigated. The interrelation between qualitative and quantitative characteristics of POM and DOM and the functional biological components involved in conversion to CO₂ have been intensively studied. Manipulation of POM and DOM inputs and the biological processing functional components show considerable promise as possible management strategies for certain stream systems.

W74-04202

A MODEL OF SALT INTRUSION IN A PARTIALLY MIXED ESTUARY,

New York Inst. of Ocean Resources, N.Y.

J. E. Overland.

Technical Report No. 73-1, September 1973. 72 p, 27 fig, 30 ref. SG 04-3-158-32.

Descriptors: *Hudson River, Model studies, *Estuaries, *Saline water intrusion, *Mixing, *New York, Run-off, *Salinity, *Path of pollu-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

tants, Dispersion, Diffusion, Turbulence, Circulation.
Identifiers: Volume transport, Tidal currents, Wind effect, Eddy viscosity, Eddy diffusivity, Halocline.

A model is developed for salt intrusion in partially mixed estuaries that specifies the vertical and horizontal distribution of salinity and volume transport in response to run-off and mixing assumptions. An estimate is made of the dispersion of a pollutant by the calculated velocity distribution in the intrusion region. The salt flux through any cross section is composed of a freshwater component, a dispersive mode resulting from density-induced flow, a dispersive mode of tidal mixing, and a diffusive mode resulting from turbulent mixing. The coupled salt and momentum equations in a vorticity-stream function formulation are solved on a numerical grid that resolves one m in the vertical and six km in the horizontal. The major dynamic simplification is specification of the channel is narrow. Thirteen examples were run to assess the effects of river discharge, wind, and various assumptions of vertical turbulent mixing. The characteristic estuary dimensions and parameters are from the Hudson River. Variable coefficients were also investigated. The coefficients consisted of an adiabatic mixing coefficient with a maximum, KM, that decreased toward the bottom and surface, modified by a separate Richardson number dependence for the eddy viscosity and the eddy diffusivity. The use of stability dependence makes a qualitative improvement over constant coefficient cases by tending to form a stronger halocline near mid-depth. The results suggest that the horizontal distribution of salinity in the Hudson River, under summer run-off conditions, is associated with high values of KM in agreement with the strong tidal currents of the Hudson. The dispersion of a slug load and continuously released pollutant was calculated using the velocities and eddy diffusivities derived by the intrusion model for summer conditions. The circulation spreads the pollutant initially, then the pollutants recirculate seaward in the surface layer and return landward in the bottom layer. (Sinha-OEIS) W74-04204

A TECHNIQUE FOR SIMULTANEOUS ECHO LOCATION OF FISH AND THERMAL PLUME MAPPING,

Argonne National Lab., Ill.
S. A. Spigarelli, G. P. Romberg, and R. E. Thorne. Transactions of the American Fisheries Society, Vol 102, No 2, p 462-466, 1973.

Descriptors: *Mapping, *Heated water, Fish, *Distribution patterns, *Lake Michigan, Electric power production, Thermal powerplants, Discharge(Water), *Thermal pollution, Aquatic environment, Environmental effects, Heat flow, Fish behavior, On-site data collections, Temperature, Diurnal distribution, Buoyancy, Mixing. Identifiers: *Thermal plume mapping, Echo location.

Thermal plume mapping procedures developed at Argonne National Laboratory and echo location procedures developed at the University of Washington(College of Fisheries) were combined to provide a technique for fish distribution studies near thermal discharges. This pilot study was performed on Lake Michigan at the Point Beach Nuclear Power Station on October 28, 1971. Reduction of fish distribution and temperature data from both day and night plume series showed striking diurnal changes in fish orientation. Many schools of fish were observed during the day series, while at night, only individual fish were observed. The depth distribution of individual fish and schools also differed between day and night. During both series fish were more numerous in the upstream side of the plume, and fish were more abundant in the cooler areas of the plume (less than 15C). (Jerome-Vanderbilt) W74-04229

THERMAL POLLUTION AND ITS CONTROL,

Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
C. T. Hill.

Environmental Affairs, Vol 2, No 2, p 406-420, 1972. 2 tab, 49 ref.

Descriptors: *Thermal pollution, *Heated water, *Cooling towers, *Cost analysis, Electric power production, Thermal power plants, Steam, Pollution control, Effluents, Aquatic environment, Environmental effects, Economics, Planning, Electrical power demand, Humidity, Air temperature. Identifiers: *Cooling ponds, Thermal efficiency.

Thermal pollution is waste heat released into the environment as an unavoidable by-product of electric power generation in steam power plants. The magnitude of the thermal pollution problem, some of the concerns raised about it, some of the technologies designed to control it, and some of the beneficial uses of waste heat are discussed. Since thermal power plants have an energy conversion efficiency of only about 40%, anywhere from 45 to 60% of the fuel used is converted into heat which is released to the environment. With the construction of less efficient nuclear power plants the heat release will probably rise in the future. About 50% of all water used in the U.S. is used for cooling, and this percentage is expected to rise as more generating facilities are constructed. The biological effects of heated effluents discharged from these facilities into the aquatic environment are often adverse. Thermal pollution can be controlled at a relatively small extra cost with cooling ponds and cooling towers. Dry cooling towers, although less efficient than other methods of cooling, are seen as the best available solution to thermal pollution. Comparative cost analyses for different cooling systems and types of power production are considered. (Jerome-Vanderbilt)

W74-04234

THE ENVIRONMENTAL AND REGULATORY ASPECTS OF THE BREEDER REACTOR,

Atomic Energy Commission Washington, D.C.
W. O. Doub.

Environmental Affairs, Vol 2, No 1, p 237-249, 1972, 35 ref.

Descriptors: *Nuclear powerplants, Research and development, *Pollutants, *Breeder reactors, Electric power production, Federal government, Research facilities, Projects, Design, *Radioactive wastes, *Thermal pollution, Air pollution, Operations research, Waste disposal, Nuclear energy, Economics, Water pollution control, Regulation. Identifiers: Liquid metal fast breeder reactors.

Demonstration liquid metal fast breeder reactor plants (LMFBR) are being developed jointly by private industry and government. Such facilities are necessary to provide sufficient amounts of inexpensive nuclear fuel to power the nation's electrical generation facilities. Such facilities can also be virtually pollution-free and their high thermal efficiency should reduce some of the thermal effects problems associated with electric power production. LMFBR support facilities are also being developed. Experience from existing facilities and the light water reactor program is being factored into the design and construction of a 400 MW (thermal) Fast Flux Test Facility (FFTF) which will be the prime irradiation facility for testing many breeder components under actual operating conditions. Although air pollution and thermal pollution may be reduced or eliminated, disposal of waste radioactive material remains something of a problem. A strict safety program against the release of radioactive material and plant breakdown must be developed. Licensing and regulation of these new facilities is discussed briefly. (Jerome-Vanderbilt)
W74-04238

THE DESIGN OF THE MONITORING SYSTEM FOR THE THERMAL EFFECT STUDY OF THE SURRY NUCLEAR POWER PLANT ON THE JAMES RIVER,

Virginia Inst. of Marine Science, Gloucester Point. R. L. Bolus, S. N. Chia, and C. S. Fang. Special Report in Applied Marine Science and Ocean Engineering No 16, October 1971. 71 p, 23 fig, 9 tab, 5 append, 12 ref. AFC-AT-(40-1)-4067.

Descriptors: *Thermal pollution, *Estuaries, *Nuclear powerplants, *Instrumentation, *Monitoring, Electric power production, Water cooling, Flow, Salinity, Temperature, Heat transfer, Discharge(Water), Effluents, *Virginia, Environmental effects, Computers, Data Collection, Operation, Design. Identifiers: *James River(Va.).

In a study of the Hog Island region of the James River estuary (which will be affected by the thermal discharges of the Surry nuclear power plant to be located there) the temperature variations, salinity, flow velocity and other factors are investigated. The instrumentation consisted of a multi-sensor unit located on a 30 foot boat, a multi-sensor system located on towers in the river and an infra-red sensor scanning device located in an airplane. Detailed data and error analyses are given for the sensors. Raw voltage data are shown in the form of computer printouts, which must be processed to obtain temperature, salinity, velocity and other specific information. This part of the study supplies the pre-operational background data which is correlated to the model study data. The study program will continue at Surry Point until there are two operational nuclear power plants in the area. The work will be useful in verifying and improving present scientific techniques of predicting changes in estuaries due to similar industrial developments. (Jerome-Vanderbilt)
W74-04246

CORRELATION OF ORGANIC CARBON WITH DIFFERENT KINDS OF OXIDIZABILITY IN THE OPEN WATERS OF LAKE BAIKAL,

Limnologicheskii Institut, Irkutsk (USSR). For primary bibliographic entry see Field 2H.

W74-04256

COAGULATION IN ESTUARIES,

North Carolina Univ. Chapel Hill. Dept. of Environmental Sciences and Engineering. J. K. Edzwald, J. B. Upchurch, and C. R. O'Melia. Environmental Science and Technology, Vol 8, No 1, p 58-63, January 1974. 6 fig, 5 tab, 21 ref. NSF Grant GF-103.

Descriptors: *Deposition(Sediments), *Colloids, *Coagulation, *Estuaries, *Clay minerals, Clays, Salinity, Hydrogen ion concentration, Water chemistry, Sedimentation, *North Carolina. Identifiers: *Pamlico estuary(N.C.).

The stability of clay suspensions as a function of ionic strength was determined from observations of coagulation rates. The stability value depends on the type of clay mineral and on chemical solution parameters such as salinity and pH. Clays can be destabilized in estuaries by compression of the electrical double layer. Measurements of the composition and stability of sediments collected along the 35-mile length of the Pamlico Estuary indicated that the sediments in the upper end of the estuary were less stable than those collected in the downstream brackish areas. Kaolinite, a relatively unstable clay, was predominant in the upstream sediments while illite, a more stable clay, accumulated in the sediments near the mouth of the estuary. These observations are consistent with the view that sediment deposition in the estuary is influenced by coagulation. The transport of colloidal suspensions from freshwaters into estuaries is accompanied by a reduction in particle stability resulting in the coagulation and deposition of

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

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suspended matter can have significant effects on water quality. Cohesive sediments such as clays and silts are responsible for the shoaling of estuarine channels, the formation of deltas, and the persistence of turbidity currents in estuaries. A substantial portion of the BOD in the effluent from conventional secondary waste treatment plants is colloidal. These organic colloids, like the inorganic clay minerals, may also coagulate in estuaries. (Knapp-USGS)
W74-04257

WATER QUALITY CYCLE--REFLECTION OF ACTIVITIES OF NATURE AND MAN,
California State Dept. of Water Resources, Los Angeles, Southern District.

A. A. Hassan.
Ground Water, Vol 12, No 1, p 16-21, January-February 1974. 5 fig, 1 tab, 2 ref.

Descriptors: Water quality, *Path of pollutants, *Hydrologic cycle, Water chemistry, *Water pollution sources, Groundwater, Surface waters, Precipitation(Atmospheric).

Identifiers: *Water quality cycle.

As water travels along the path of the hydrologic cycle, it changes from pure salt-free water suspended in the troposphere to ocean brines. Along the way, it progressively picks up salts in the atmosphere, on the earth's surface, through the soil medium and the unsaturated zone, and the saturated zone. Percolation of waste discharges and recycling of groundwater through man's use add other complex factors. The process is a water quality cycle. Although water may be abundant, it may not all be fit for use. Understanding of the intricate processes that cause the change in the chemical composition of water is necessary to implement sound water quality management. (Knapp-USGS)
W74-04263

THE INFLUENCE OF SUSPENDED PARTICLES ON THE PRECIPITATION OF IRON IN NATURAL WATERS,
Imperial Coll. of Science and Technology, London (England). Dept. of Geology.

S. R. Aston, and R. Chester.
Estuarine and Coastal Marine Science, Vol 1, No 3, P 225-231. July 1973. 2 fig, 1 tab, 22 ref.

Descriptors: *Estuaries, *Suspended load, *Iron, *Hydrolysis, Colloids, Water chemistry, *Path of pollutants, Salinity, Chemical precipitation, Hydrogen ion concentration, Oxidation-reduction potential.

Radiotracer experiments determined the effects of suspended sediment particles and changes in salinity on the precipitation of iron in seawater. Both increasing salinity and the presence of suspended particles increase the rate and extent of iron precipitation in seawater. Electrophoretic measurements show that the surface charge of sediment particles becomes less negative during the hydrolysis and precipitation of iron. This is a result of the sediment particles acting as negative nuclei for the aggregation of iron hydrolysis products. Estuaries are transitional environments where river and seawaters, which have very different physiochemical properties, have their initial contact and, therefore, undergo their initial interactions. One of these interactions involves the precipitation and flocculation of iron which has been kept in 'solution' or as stabilized colloid under the physiochemical conditions operative in river water. After their formation in the estuarine environment the iron particles can be important in the control of oceanic trace element budgets. The hydrous oxides of iron are very efficient scavengers of trace elements. Some of the iron particles become involved in biological processes. Others may sink to the bottom and be incorporated into estuarine and deltaic sediments. The small parti-

cles of hydrous iron oxides formed in estuarine environments may play an important role in transporting elements such as cobalt and nickel to deep-sea areas where they are enriched in the underlying sediments. Another role in which the hydrous oxides or iron may be important in estuaries is that by forming coatings around the sediment particles, which have acted as nuclei for aggregation, they can prevent trace element desorption from ion exchange sites in addition to acquiring fresh trace elements by adsorption from solution. (Knapp-USGS)
W74-04272

SOME PHYSICAL AND CHEMICAL PROPERTIES OF THE GULF OF CORINTH,
Washington Univ. Seattle. Dept. of Oceanography..

For primary bibliographic entry see Field 2L.
W74-04273

SPECTROPHOTOMETRIC DETERMINATION OF HEXACHLOROBUTADIENE (HCBD) IN SOIL AND WATER, (IN RUSSIAN),

Akademiya Nauk Moldavskoi SSR, Kishinev.
Yu. S. Lyalikov, and L. M. Dranovskaya.
Gig Sanit. Vol 37, No 5, p 57-59. 1972. Illus.
Identifiers: *Butadiene(Hexachloro-), *Spectrophotometry, Pollutant identification, Path of pollutants, Soil analysis.

Spectrophotometric determinations confirmed that hexachlorobutadiene (HCBD) migrates from the upper layers of soil to deeper layers and can persist there unaltered for a long time. The spectrophotographic method recommended can be used to determine HCBD in soil and water. It is sensitive (2 micrograms in a sample) and specific.—Copyright 1973, Biological Abstracts, Inc.
W74-04293

5C. Effects Of Pollution

THERMAL TOLERANCES OF INTERIOR ALASKAN ARCTIC GRAYLING (THYMALLUS ARCTICUS),

Alaska Univ., College. Inst. of Water Resources.
J. D. LaPerriere, and R. F. Carlson.
Availability from NTIS as PB-227 239 \$3.25 in paper copy, \$1.45 in microfiche. Report No IWR-46, December, 1973. 5 p, 2 fig, 10 tab, 13 ref. OWRR A-041-ALAS(3).

Descriptors: *Bioassay, Fish, *Thermal pollution, *Alaska, Subarctic, Heat resistance, Water pollution effects, Water temperature.

Identifiers: *Arctic grayling, Thymallus arcticus, *Thermal tolerance, Chena River(Alas).

Arctic grayling, *Thymallus arcticus*, captured from the Chena River in Interior Alaska or artificially propagated from the sex products of fish from this population were tested for tolerance to elevated water temperatures. Most tests were conducted in recirculating temperature-controlled tanks with a few conducted as standard static bioassays. Median tolerance limit ranges were delineated for sac fry, young-of-the-year, fish larger than 10 cm, and fish larger than 20 cm. There is some evidence that the least sensitive life cycle stage is the young-of-the-year which had a median tolerance limit above 24.5°C after acclimatization of 8.5°C plus or minus 1°C. Equipment limitations did not allow acclimatization of all fish at the same temperature, however. Therefore, some changes in tolerance due to life cycle changes were somewhat masked by the effect of different acclimatization temperatures.
W74-03759

SOME EFFECTS OF WASTES ON NATURAL WATERS,
Vanderbilt Univ., Nashville, Tenn.

For primary bibliographic entry see Field 5B.
W74-03793

FISH BEHAVIOR RELATED TO THERMAL POLLUTION,

Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
H. K. Hagen.

In: *Environmental Impact on Rivers (River Mechanics III)*, edited and published by Hsieh Wen Shen, Fort Collins, Colo. Chapter 11, p 11-1-11-23, 1973. 7 fig, 1 tab, 20 ref.

Descriptors: *Thermal pollution, Fish, *Fish behavior, Migration, Fish physiology, Fish reproduction, Pathology, Stratified flow, *Thermal stratification, *Water pollution effects.

Fish behavior is discussed as related to thermal pollution. Because coldblooded animals cannot change their body temperature by losing water vapor in expired air or in sweat as a warmblooded animal can, they are severely handicapped in an environment that might be subjected to rapid or extreme thermal fluctuations. The growth of fish is also closely related to temperature and has much narrower limits than the lethal boundaries. In most species the food consumption and growth rate will increase in a sigmoid pattern in response to temperature increases, but in many instances after a leveling is reached, any increase in temperature will cause a decrease in feeding and growth, or both, with a resulting, often rapid, decrease in body weight and stamina. Any temperature change will have an ultimate effect on fish. Of major concern in thermally polluted waters is the possible blockage of migrations by either anadromous or catadromous fishes. Fish and many of the invertebrates of the Firehole River in Yellowstone Park seem aware of the stability of heated water layers and maintain themselves only inches from scalding temperatures. Although layering is generally a function of volume and surface area, in several instances very resistant stratification occurs in no more than twelve inches of depth. In smaller streams such as Witch Creek, where some thermal discharges approached 20% of the streamflow, the boundary zones were distinct enough so that the fish could pass freely up and down the stream. (Knapp-USGS)
W74-03795

STUDIES ON UPTAKE AND LOSS OF METHYLMERCURY-203 BY BLUEGILLS (LEPOMIS MACROCHIRUS RAF.),

Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.

W. D. Burrows, and P. A. Krenkel.
Environmental Science and Technology, Vol 7, No 13, p 1127-1130, December 1973. 3 fig, 2 tab, 21 ref.

Descriptors: *Bioassay, *Sunfishes, Absorption, *Mercury, Heavy metals.

Identifiers: *Bioaccumulation, *Biotransformation, *Methylmercury, Excretion, Elimination, Biological samples, Kidneys, Liver.

The uptake of methylmercury-203 directly from water by bluegills was found to be nearly constant after five days at about 20 percent per gram of fish per liter of water. Transferred to mercury-free water at 24°C, bluegills exhibited a rapid loss of about 40 percent of the mercury, followed by a slow loss with a half-time of about five months. Mercury levels in the liver and kidneys were two to seven times higher than whole fish levels, but there was no discernible trend in this ratio with time. The proportion of mercury present as methylmercury in the whole fish remained at 73 plus or minus 10 percent throughout the course of the experiment. The proportion of methylmercury in the liver and kidneys, however, fell rapidly in the first few weeks after exposure, ultimately leveling off at about 10 percent. This suggests that biochemical demethylation is taking place in these organs. (Little-Battelle)

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Group 5C—Effects Of Pollution

W74-03839

BIOLOGICAL EFFECTS OF OCEAN DISPOSAL OF SOLID WASTE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. D. Pratt, S. B. Sails, A. G. Gaines, Jr., and J. E. Krout.
Marine Technical Report Series Number 9, 1973. 53 p, 26 fig, 19 tab, 176 ref.

Descriptors: Model studies, *Water pollution effects, *Degradation(Decomposition), *Waste disposal, Oceans, *Solid wastes, Laboratory tests, *Oxygen demand, Gases, Marine fish, *Benthic fauna, Connate water, Sea water, Bioassay, Toxicity, Organic matter, Water quality, Nitrogen, Hydrogen sulfide, Oxygen, Methane, Fouling, Carbon dioxide, Foods, Heavy metals, Water analysis, Dissolved solids, Shrimp, Crabs, Clams, Mussels, Plastics.

Identifiers: Fate of pollutants, Gas production, *Capitella capitata*, *Nereis succinea*, Barnacles, Macroinvertebrates, Paper, Glass, Characterization, Dissolved organic carbon, Dissolved organic nitrogen, Mobilization.

The possible biological effects of disposal of compressed solid waste was studied by conducting literature research and laboratory tests with scaled down waste samples. Tests were conducted in tanks (16 ft X 1 ft X 1 ft) flooded with test waste consisting of paper, food, tin cans, aluminum, plastic, and glass. A control tank was flooded with sand. Oxygen uptake was studied in a 4 ft X 4 in. X 4 in. tank, and waste degradation was monitored in 20-gal tanks in a temperature controlled bath. A variety of dissolved substances were monitored in water overlying the waste and in interstitial water. Interstitial water was monitored in tanks containing high organic waste in salt water and in fresh water, high organic waste in salt water poisoned with mercuric chloride, and low organic waste in salt water. Analysis of gas production from the model systems and from slurries suspended in seawater showed that H₂, O₂, N₂, CH₄, CO₂, and H₂S were produced. Rate of oxygen uptake in the test tank was several times higher than that of the control tank, but never exceeded 100 ml/sq m/hr. Slides in the waste tank were fouled by filaments of sulfide bacteria which also contained nematodes, oligochaetes, and harpacticoid copepods. Only two large infaunal species colonized the waste deposits: *Capitella capitata* and *Nereis succinea*. Marine fish and shrimp died in 72-hr bioassays in which they were exposed to water flowing over the waste. No mortality occurred with barnacles, hermit crabs, rock crabs, mussels, surf clams, or oceangoing hogs. The major toxicant was H₂S. It is concluded that degradation of solid waste will be slow in the ocean. However, more research is needed before the long-term effects and consequent safety of ocean disposal can be adequately assessed. (Little-Battelle)

W74-03840

THE EFFECT OF HYPOCHLORITE ON THE GERMINATION OF SPORES OF CLOSTRIDIUM BIFERMENTANS,
Agricultural Research Council, Norwich (England). Food Research Inst.
L. R. Wyatt, and W. M. Waites.
Journal of General Microbiology, Vol 78, No 2, p 383-385, October 1973. 1 tab, 10 ref.

Descriptors: *Clostridium, *Germination, *Spores, *Cultures, *Disinfection, Chlorine, Microscopy, Spectrophotometry, Resistance.
Identifiers: *Hypochlorites, Disinfectants, Survival.

To investigate the effect of hypochlorite on germination of spores, a suspension of Clostridium bifermentans containing about 3.5 mg dry wt spores was centrifuged at 1500 g for 10 min and the spore pellet resuspended in 5 ml of a solution of

100 micrograms sodium hypochlorite/ml containing 50 micrograms free chlorine. The suspension was incubated for 10 min at 0°C and centrifuged at 35000 g for 3 min, and the spores were washed once in 10 ml glass-distilled water and stored at 4°C and then resuspended in 15 ml glass-distilled water and stored at 0°C until required for measurement of germination rates. Germination rates were measured at 37°C either spectrophotometrically or microscopically. Incubation with a solution of sodium hypochlorite increased the germination rate of spores of mutants of Clostridium bifermentans by up to 3500-fold and in some cases to about that of the wild-type. Hypochlorite treatment resulted in about a 60 percent decrease in viable spores. The efficiency of chlorinating agents as disinfectants may be due, in part, to stimulation of spore germination followed by inactivation of the germinated spore. (Mortland-Battelle)

W74-03841

OCCUPATIONALLY RELATED HEALTH HAZARDS IN WASTEWATER TREATMENT SYSTEMS, Ottawa Univ. (Ontario).

T. Viraraghavan.
Water Pollution Control Federation Highlights, Vol 10, No 11, p D2-D3, November 1973. 1 tab, 10 ref.

Descriptors: *Municipal wastes, *Waste water treatment, *Pathogenic bacteria, *Human diseases, Public health, Hazards, *Canada, Nematoles.

Identifiers: *Occupational health, Hepatitis, Typhoid, Paratyphoid, Dysentery, Tuberculosis, Poliomyelitis, Leptospirosis.

A study was undertaken by Ontario municipalities to evaluate the health hazards to the workers in their wastewater systems. Twenty-five municipalities were addressed for specific information on the number of workers in their collection and treatment systems who, during the period of 1970 to October 1972, and as a result of their occupations, contracted any of the following diseases: typhoid/paratyphoid fevers, bacillary dysentery, amoebic dysentery, roundworm or other worm infections, tuberculosis, poliomyelitis, infections hepatitis, and leptospirosis (Weil's disease). The cities were also requested to state whether any of those diseases contracted resulted from accidental falls into the works or from prolonged exposure only. Three municipalities reported four occupational cases of infectious hepatitis in their workers. No municipality reported any of the other seven diseases as having been contracted resulting from the occupations of the wastewater workers. This preliminary study indicated that health hazards may exist among the workers in wastewater treatment works, although the actual incidence of disease may not be high. The few cases of infectious hepatitis reported could also be chance occurrences. There is need for (1) further detailed studies in which the health of a worker before he joins the works is fully ascertained and documented and (2) periodical examination for many of these diseases. (Mortland-Battelle)

W74-03853

IN-PLANT BIOLOGICAL MONITORING,

For primary bibliographic entry see Field 5A.

W74-03855

EFFECT OF PH ON TOXICITY OF COPPER TO SCYALIDIUM SP., A COPPER-TOLERANT FUNGUS, AND SOME OTHER FUNGI,

Rutgers - The State Univ., New Brunswick, N.J. Coll. of Agriculture and Environmental Science.

R. L. Starkey.

Journal of General Microbiology, Vol 78, No 2, p 217-225, October 1973. 5 tab, 32 ref.

Descriptors: *Copper, *Toxicity, *Hydrogen ion concentration, *Fungi, Iron, Chromium, Cobalt, Chlorides, Cultures, Nitrogen, Salts, Heavy metals, Water pollution effects.

Identifiers: *Scyhalidium, *Oxine, *EDTA, Chelating agents, Culture media.

The effect of the chelating agents, oxine (8-hydroxy-quinoline) and EDTA (ethylenediaminetetra-acetic acid) on toxicity of copper to Scyhalidium sp., and the influence of salts of iron, cobalt and chromium on development of the fungus, have been determined. Scyhalidium sp. grew in acidic media (pH 2.0 to 0.3) saturated with copper sulphate (approx. 1 M) but was sensitive to low concentrations of copper (0.0004 M) near neutrality. Eleven other fungi (Aspergillus, Penicillium, Trichoderma, Fusarium, Monilia, Stemphylium, and Rhizopus) differed in that they tolerated relatively high concentrations of copper near neutrality; nine tolerated high concentrations from pH 3.0 to 7.0, and six tolerated 0.004 M copper sulphate at pH 2.0 to 7.0. Oxine was more toxic to Scyhalidium sp. at neutrality than it was at an acid pH and in the presence of relatively large amounts of copper. EDTA had no appreciable effect on toxicity of copper. The fungus was relatively tolerant to chlorides of iron, cobalt and chromium at both neutral and acid pH. (Mortland-Battelle)

W74-03857

ALGAL GROWTH PREDICTION USING GROWTH KINETIC CONSTANTS,

National Inst. for Water Research, Pretoria (South Africa).

D. F. Toerien, and C. H. Huang.
Water Research, Vol 7, No 11, p 1673-1681, November 1973. 2 fig, 4 tab, 15 ref.

Descriptors: *Growth rates, *Kinetics, *Phosphorus, *Bioassay, *Cultures, Forecasting, Time, Eutrophication, Biomass, Nutrients, Suspended solids, Chlorophylla, Sodium, Magnesium, Sulfur, Calcium, Carbon, Iron, Boron, Zinc, Cobalt, Copper, Molybdenum, Estimating, Limiting factors.

Identifiers: *Selenastrum capricornutum, Batch cultures.

The growth kinetics under conditions of phosphorus limitation of *Selenastrum capricornutum* Printz, a green alga specified for use in algal bioassays, were used to predict growth in batch cultures for varied specific conditions of time and phosphorus concentration. These predictions compared very well with actual batch culture growth studies. The predicted maximum cell concentration for two different levels of phosphorus lay within values obtained in different laboratories. The predicted maximum specific growth rates were either close to or just above actual laboratory data. The determination of growth kinetics thus allows accurate prediction of the growth of planktonic algae, a benefit in either algal bioassays or the solution of practical eutrophication problems. The growth kinetic constants of specific algae important in eutrophication problems need to be determined in order to utilize potentialities of prediction in the rational solution of these problems. (Mortland-Battelle)

W74-03871

EFFECT OF PHENOL ON OXYGEN UPTAKE RATE OF A LABORATORY POPULATION OF CHIRONOMUS ATTENUATUS (WALK.),

Mid-America Nazarene Coll., Olathe, Kans.

S. L. Cole, and J. Wilhm.
Water Research, Vol 7, No 11, p 1691-1700, November 1973. 6 fig, 2 tab, 27 ref.

Descriptors: *Diptera, *Oxygen, Absorption, *Phenols, *Toxicity, *Bioassay, Respiration, Larvae, Water temperature, Hydrogen ion concentration, Dissolved oxygen, Weight, Regression analy-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

sis. Water quality, Oxygen demand, Equations, Water pollution effects, Aquatic insects, Midges. Identifiers: *Chironomus attenuatus, Macroinvertebrates, Oxygen consumption.

A laboratory population of fourth-instar larval forms of Chironomus attenuatus Walker received a continuous life-long exposure of 0, 2.8, 11.2, 16.3, and 22.4 ppm phenol. Measurements were taken of water temperature, pH, and dissolved oxygen concentration. Larvae exposed to the different phenol concentrations were analyzed for oven-dry weight and ash-free weight. The oxygen uptake was determined. The regression of oxygen uptake (Y), adjusted for phenol level, pH, and oxygen concentration, on ash-free weight (X) was $\log Y = 0.173 - 0.478 \log X$. The regression of adjusted oxygen uptake (Y) on phenol concentration (X) was $Y = 1.632 + 0.299 \log X$. Calories lost through respiration (Y) were related to phenol level (X) by the equation, $Y = 0.0021 + (0.000386) \log X$. The ash-free weight per individual (Y) decreased with increasing phenol concentration (X) as explained by the equation, $Y = 0.114 \log X$. (Mortland-Battelle) W74-03872

CHRONIC TOXICITY OF A COPPER, CADMIUM AND ZINC MIXTURE TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS RAFINESQUE),
National Water Quality Lab., Duluth, Minn.
J. G. Eaton.
Water Research, Vol 7, No 11, p 1723-1736, November 1973. 1 fig, 7 tab, 19 ref.

Descriptors: *Copper, *Cadmium, *Zinc, *Toxicity, *Bioassay, Lethal limit, Spectrophotometry, Water temperature, Growth stages, Spawning, Larvae, Minnows, Heavy metals, Mortality, Water analysis. Identifiers: *Fathead minnow, Embryos, Atomic absorption spectrophotometry, Synergistic effects, Threshold toxicity, Continuous flow technique.

Fathead minnows were exposed to a series of concentrations of a copper, cadmium and zinc mixture during a 12.5 month chronic test in water of 200 mg/l total hardness. The metal concentrations in the mixture were selected on the basis of results obtained during previous chronic exposures to each of the metals individually in the same water. Strict summation of the chronic toxicities of the metals was not indicated when they were tested in combination. Toxic effects of the mixture attributable to copper appeared to be increased, but that attributable to cadmium was reduced. The effects thought to be due to zinc were similar in degree to those observed in the single chronic exposure. Summation of effects resulting from a mixture containing about the same proportions of copper, cadmium and zinc occurred at a much higher, acutely lethal concentration. A lethal threshold was attained in the mixture when each metal was present at a concentration of 0.4 or less of its individual lethal threshold. (Mortland-Battelle) W74-03873

THERMOPHILIC FUNGI IN A MUNICIPAL WASTE COMPOST SYSTEM,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-03875

OIL-INDUCED MORTALITIES IN JUVENILE COHO AND SOCKEYE SALMON,
Alaska Univ., College. Dept. of Biological Sciences.
J. E. Morrow.
Journal of Marine Research, Vol 31, No 3, p 135-143, September 15, 1973. 6 tab, 15 ref.

Descriptors: *Sockeye salmon, *Toxicity, *Lethal limit, *Water temperature, *Fish behavior, *Bioassay, Sea water, Mortality, Stress, Arctic, Oil, Aging(Physical), Juvenile fish. Identifiers: *Coho salmon, *Crude oil.

A laboratory study was undertaken to determine the effects of crude oil in concentrations that might occur from an oil spill on sockeye and coho salmon. Specimens aged 9 to 13 months that had been raised from eggs were first acclimated to artificial seawater of 3 percent salinity. Crude oil was introduced in concentrations from 500 to 3500 ppm and the water temperature was set at 3, 8, or 13°C. Stress behavior under the influence of oil was also investigated. Mortality rates of up to 100 percent were produced in 96 hrs. The majority of the 96-hour experimental mortality rates were significantly higher than the mortality rates of control animals. The mortality rates were directly related to the concentration of oil, but appeared to be inversely related to water temperature. Mortality apparently was caused by some component of crude oil that is soluble in water and is also volatile and/or easily oxidized. It was found that crude oil loses its toxicity to salmon after exposure to air, probably through the loss of volatile toxic components. Hence, conclusions based on bioassay work with oil of unknown history may be less valuable than those derived from studies wherein the handling history of the oil is known. (Mortland-Battelle) W74-03876

MIXED CULTURE BIOOXIDATION OF PHENOL. I. DETERMINATION OF KINETIC PARAMETERS,
State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
U. Pawlowsky, and J. A. Howell.
Biotechnology and Bioengineering, Vol 15, No 5, p 889-896, September 1973. 4 fig, 3 tab, 21 ref.

Descriptors: *Phenols, *Oxidation, *Cultures, *Kinetics, *Growth rates, Activated sludge, Protozoa, Statistical methods, Rotifers, Sphaerotilus, Algae, Fungi, Metabolism, Soil, Sewage treatment, Chemical oxygen demand, Spectrophotometry, Microbial degradation, Sewage bacteria. Identifiers: *Biooxidation, Ultraviolet spectrophotometry, Substrate utilization, Mixed cultures.

A mixed culture derived from soil and activated sludge organisms was used to degrade phenol which was inhibitory to microorganisms at higher concentrations. The purpose of the experiments was to determine the kinetic parameters governing growth of the organisms by measuring growth rates in batch culture. To maintain a constant inoculum for the experiments, inoculum was taken from a continuously operating continuous culture. Two populations were studied corresponding to two separate residence times in the continuous culture apparatus. One contained predominantly filamentous organisms, the other nonfilamentous. Five kinetic models were applied to the data and the best kinetic parameters for each model were determined by nonlinear least squares techniques. The models were then evaluated for best relative fit to the data. No significant differences were found between the models on the basis of fit and so a choice was made on the grounds of simplicity. A model proposed by Haldane was chosen as the best. No function however gave a satisfactory fit at the highest growth rates obtained. This experimental maximum in the plot of growth rate against substrate concentration was very sharp. (See also W74-03880 and W74-03881) (Mortland-Battelle) W74-03879

MIXED CULTURE BIOOXIDATION OF PHENOL. II. STEADY STATE EXPERIMENTS IN CONTINUOUS CULTURE,
State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
U. Pawlowsky, and J. A. Howell.
Biotechnology and Bioengineering, Vol 15, No 5, p 897-903, September 1973. 5 fig, 15 ref.

Descriptors: *Phenols, *Model studies, Cultures, Kinetics, Biomass, Sewage bacteria, Oxidation, Spectrophotometry, Gravimetric analysis, Statistical methods, Sewage treatment, Mathematical models.

Identifiers: *Biooxidation, *Continuous cultures, *Wall growth, Steady State experiments, Biological reactors, Mixed cultures, Substrate utilization.

A problem in steady-state analysis of the continuous stirred tank biological reactor is the failure to predict the effect of high dilution rate near the washout condition. One cause could be apparatus effects, the most likely of which is bacterial growth on the walls of the reactor. This study attempted to test the applicability of a wall-growth factor in a model developed for the case of substrate inhibited kinetics. Continuous culture experiments, using a mixed population of organisms on phenol, were performed in continuous stirred tank biological reactors. Steady state phenol concentrations were measured by ultraviolet spectrophotometry for a range of inlet concentrations from 100 to 800 mg at various dilution rates. These results were compared with those predicted from the model. The effect of growth on the walls of the vessel was considerable and increased by a factor of up to 3X the dilution rate at which 90 percent conversion of phenol could be obtained. (See also W74-03879) (Mortland-Battelle) W74-03880

MIXED CULTURE BIOOXIDATION OF PHENOL. III. EXISTENCE OF MULTIPLE STEADY STATES IN CONTINUOUS CULTURE WITH WALL GROWTH,
State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
U. Pawlowsky, J. A. Howell, and C. T. Chi.
Biotechnology and Bioengineering, Vol 15, No 5, p 905-916, September 1973. 7 fig, 3 tab, 6 ref.

Descriptors: *Phenols, *Model studies, *Sewage bacteria, Cultures, Biomass, Oxidation, Mathematical models. Identifiers: *Biooxidation, *Continuous cultures, *Wall growth, Steady State experiments, Biological reactors, Shock loading, Mixed cultures, Substrate utilization.

It is shown that two steady states exist in certain regions of operation of a 2-liter continuous stirred tank biological reactor. Transition was made from one steady state to another by applying shock loads of either phenol substrate which is inhibitory to the culture at high concentrations or by adding large additional amounts of concentrated organisms. The existence of the multiple steady states is ascribed to the existence of wall growth, and their position is determined by the amount of wall growth. Transient behavior of the system did not follow the predictions of the simple wall growth model but the culture appeared to undergo a lag period immediately after applying the shock load to the system. It is concluded that the stability of a continuous culture utilizing an inhibitory substrate is improved by increasing the degree of wall growth and decreasing the substrate feed concentration. It is also concluded that small scale experiments can usually not be interpreted correctly unless the effect of wall growth is taken into account. (See also W74-03879) (Mortland-Battelle) W74-03881

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

PHENOTYPIC VARIABILITY OF THE ENVELOPE PROTEINS OF KLEBSIELLA AEROGENES,
Microbiological Research Establishment, Salisbury (England).
A. Robinson, and D. W. Tempest.
Journal of General Microbiology, Vol 78, No 2, p 361-370, October 1973. 4 fig, 2 tab, 24 ref.

Descriptors: *Proteins, *Isolation, Cultures, Sulfur, Nutrients, Growth rates, Separation techniques, Electrophoresis, Carbohydrates, Potassium, Magnesium, Phosphates, Ammonia, Sulfates, Aerobic bacteria, Centrifugation, Limiting factors, Enteric bacteria, Cytological studies. Identifiers: *Klebsiella aerogenes, Glucose, Chemostat, Sample preparation, Gel electrophoresis, Culture media, Continuous cultures, Cell envelopes.

The envelope proteins of Klebsiella aerogenes (syn. Aerobacter aerogenes) grown in glucose-, sulphate-, phosphate-, ammonia-, potassium- and magnesium-limited environments, in chemostats, have been isolated, and compared by SDS-polyacrylamide gel electrophoresis; marked differences were evident. The envelopes from glucose- and sulphate-limited organisms were examined further: protein content was growth-rate dependent, but sulphate-limited envelopes always contained less protein than glucose-limited envelopes, and this protein had a lower sulphur content. The sulphate-limited envelopes contained one major protein component with a molecular weight of 30,000 daltons whereas the glucose-limited envelopes contained three main protein components (molecular weights of 46000, 38000 and 28500 daltons). Selective extraction of membrane proteins with Triton X-100 indicated that both wall and membrane proteins altered in response to changes in the growth environment. Similarly, the soluble proteins of the organisms varied, but the ribosomal proteins remained almost constant. (Mortland-Battelle)
W74-03882

NORTH CAROLINA MARINE ALGAE. II. NEW RECORDS AND OBSERVATIONS OF THE BENTHIC OFFSHORE FLORA,
Duke Univ., Durham, N.C. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-03885

THE CHARACTERIZATION AND INFLUENCE OF DOMESTIC DRAIN EFFLUENTS ON THE RED CEDAR RIVER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W74-03895

MERCURY: UPTAKE BY THE GOLDFISH, CARASSIUS AURATUS, FROM LOW CONCENTRATIONS IN WATER AND ITS TISSUE DISTRIBUTION,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.
D. H. Baker, III.
Available from the National Technical Information Service as PB-227 462; \$5.25 in paper copy, \$1.45 in microfiche. M.S. Thesis, 1973. 37 p, 6 fig, 5 tab, 19 ref, 2 append. OWRR A-038-NMEX(1).

Descriptors: *Water quality, *Mercury, Fish, *Heavy metals, Water pollution effects, Water chemistry, *Water pollution sources, Path of pollutants. Identifiers: *Goldfish, Aquatic systems, Methyl mercury, Dimethyl mercury, Mineral content.

The uptake and distribution of mercury in selected tissue of goldfish (*Carassius auratus*) from low-level mercury contaminated water were determined. The mercury concentration was 5 ppb and

tissue analyzed were liver, kidney and muscle. Goldfish accumulate mercury from low-level mercury concentration in water. The whole body mercury increase in the fish was from 0.07 to 1.3 ppm. The selected tissues (kidney, liver and muscle) showed accumulations from 3 to 14 ppm, 1 to 10 ppm and 0.06 to 1.2 ppm respectively. The mercury in the water demonstrated a cyclic nature from the inorganic form to organic form and back. Mercury was also rapidly lost from the aquatic system and the water had to be continually monitored to determine the amount of mercury to be added to maintain the 5 ppb level. (Creel-New Mexico)
W74-03898

A STUDY OF MERCURIALS IN THE ELEPHANT BUTTE RESERVOIR ECOSYSTEM, New Mexico Univ., Albuquerque. Dept. of Biology.

J. D. Garcia.

Available from the National Technical Information Service as PB-227 458; \$9.75 in paper copy, \$1.45 in microfiche. Ph. D. Dissertation, 1973. 128 p, 26 tab, 3 fig, 83 ref. OWRR A-040-NMEX(1).

Descriptors: *New Mexico, *Ecosystems, *Trophic level, Fish, *Mercury, *Aquatic animals, Turtles, Crayfish, Zooplankton, Food chains, Fish diets, *Freshwater fish, Bass, Channel catfish, Lake trout, Carp, Suckers, Walleye, Mussels, Organic matter, Water pollution sources, Water pollution effects.

Identifiers: *Mercurials, Bioamplification, Non-vascular plants, Organic debris, Percies.

Analyses of samples for mercury from Elephant Butte Lake collections were made by a flameless atomic absorption procedure. Analyses revealed mean ppb mercury concentrations of 0.027 in water, 57 in bottom sediments, 109 in phytoplankton, 277 in attached algae and bryophytes, 95 in plant debris, 69 in zooplankton, 90 in crayfish muscle, 26 in visceral mass of mussels, 97 in muscle of nonpredaceous fish, 125 in muscle of small predaceous fish, 253 in muscle of large predaceous fish, and 266 in muscle of two turtle species. Tissues grouped by relative levels for the sixteen fish species show consistently lower levels in bone, skin, gills, and eyes; intermediate levels in stomach, intestine, heart, and brain; and higher levels in spleen, muscle, kidney, and liver. General bioamplification at higher trophic levels appears to be diet related, but the relationship does not hold for lower trophic levels. Mercury levels in the water indicate a decreasing gradient from inlet to dam, while sediments display an increasing gradient from inlet to dam. Arguments are given which attempt to account for concentration in some higher trophic level species. Evidence suggests that mercury levels are related to seasonal conditions. A bioamplification scheme and concentration factors are presented which describe the status of mercury concentrations in existing trophic levels. The potential hazards of Elephant Butte fish to human health are discussed. (Creel-New Mexico)
W74-03909

A COMPARISON OF INVERTEBRATE DRIFT IN THREE MICHIGAN STREAMS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W74-03902

POTAMOLOGICAL EFFECTS OF FISH HATCHERY DISCHARGE ON THE JORDAN RIVER, NORTHERN LOWER MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. T. Szluha.

Available from the National Technical Information Service as PB-227 459; \$6.75 in paper copy, \$1.45 in microfiche. Ph.D. Thesis, 1972. 62 p, 11

fig, 10 tab, 37 ref, append. OWRR C-1663(3153)(6), C-2205(3386)(4) and C-3381(3723)(7). 14-31-0001-3153, 14-31-0001-3386.

Descriptors: Potamology, Fish hatcheries, Channel morphology, Metabolism, *Periphyton, *Michigan, *Lake trout, Settling basins, Water pollution effects.

Identifiers: Jordan River(Mich), Ecological impact, *Fish hatchery wastes, *Oxygen balance.

The Bureau of Sport Fisheries and Wildlife is operating a lake trout (*Salvelinus namaycush*) hatchery in the Jordan River Valley utilizing two systems of springs for its water supply. Until the spring of 1972 the hatchery had been discharging its waste into the Jordan River without any formal treatment. During the winter of 1971 and 1972 two settling basins were built to remove 80-95% of settleable solids from the wastewater. In order to evaluate the ecological impacts of the hatchery wastes on the receiving stream, periphytic production rates and the oxygen balance were determined at locations above and below the outfalls during March through June 1971 and again in 1972. Periphytic production rates increased exponentially during the study periods. Mean productivity rates were seven times greater below the outfalls than at the control station above the discharge in 1971, and five times greater in 1972. Diurnal oxygen concentrations and temperature curves were obtained from sections above and below the hatchery discharges in order to estimate gross primary production and community respirations. However, undeterminable ground and surface water accrual with oxygen concentrations usually lower than in the Jordan River distorted rates of changes of oxygen concentrations which were necessary to calculate gross primary production and community respiration. A primary production index was calculated from the diurnal oxygen curves. These data indicated that the oxygen balance in the Jordan River was not effected significantly by the hatchery effluent either before or after installation of settling basins.
W74-03903

THE DYNAMICS OF BROWN TROUT (SALMO TRUTTA) AND SCULPIN (COTTUS SPP.) POPULATIONS AS INDICATORS OF EUTROPHICATION,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
W. L. Smith.

Available from the National Technical Information Service as PB-227 455; \$5.75 in paper copy, \$1.45 in microfiche. Ph.D. Thesis, 1972. 43 p, 3 fig, 19 tab, 33 ref, 5 append. OWRR C-3381(3723)(5) and C-1663(3153)(5). 14-31-0001-3723.

Descriptors: *Fish populations, Fish reproduction, Sexual maturity, *Brown trout, Michigan, *Eutrophication, *Sculpins.

Identifiers: Jordan River(Mich), Au Sable River(Mich), Sculpin maturity.

Brown trout and sculpin populations were studied in three variously perturbed stream sites in northern Michigan. Intraspecific comparisons were made of several aspects of population dynamics including the intrinsic rate of natural increase (r). The upper Jordan River, nearly pristine and with high population densities, exhibited r values judged adequate for maintenance of the populations. The other sites were compared with this baseline. The moderately perturbed lower Jordan River had less population densities and survival but greater mean fecundities for both species. This resulted in a positive r for the trout but the birth rate of the sculpins could not compensate for the death rate and the population was declining. The Au Sable River, the most eutrophic and suspected of being marginal trout water, also had lesser population densities and greater mean fecundities than the upper Jordan. Survivorship of the sculpins was sufficient to yield a positive r .

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However, the low survival of the trout resulted in a strongly negative r, suggesting inability of the population to sustain itself. It appeared that moderate eutrophication enhanced the reproductive capability of trout but beyond a certain level of perturbation the effects were damaging. Fishing pressure, genetics, and species interaction could also have influenced the results. The intrinsic rate of natural increase of short-lived, coldwater fish species should be a useful tool in monitoring water quality, especially if studies continue through several generations.

W74-03904

BENTHIC MACROINVERTEBRATE DIVERSITY IN THREE DIFFERENTIALLY PERTURBED MICHIGAN STREAMS,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

S. J. Reger.

Available from the National Technical Information Service as PB-227 615; \$7.00 in paper copy, \$1.45 in microfiche. M.S. Thesis, 1973. 60 p., 3 fig., 18 tab., 41 ref., append. OWRR C-3381(3723)(8).

Descriptors: *Invertebrates, *Systematics, Michigan, *Standing crops, *Biomass, Water quality, *Nutrients, Discharge frequency, Watersheds(Basins).

Identifiers: Jordan River(Mich), Au Sable River(Mich), Red Cedar River(Mich), Annual cycle, Grayling(Mich).

The macroinvertebrate community structures of three Michigan streams were examined through an annual cycle. Study sites were located above and below known sources of human disturbance on each stream. Taxonomic composition, standing crops, and diversity of both numbers of individuals and biomass were used in an attempt to describe the effects of cultural development on the streams. Macroinvertebrate diversity indices calculated using numbers of individuals were found to be more sensitive than other indicators of human perturbation, particularly when comparing sections of any given stream. The city of Grayling's sewage treatment plant's conversion of land disposal resulted in increased diversity of the lower Au Sable River from an earlier study. This change was not noticeable by direct measurement of chemical water quality parameters. Nutrient enrichment appeared to result in an increased production of macroinvertebrates, followed closely by a decreased diversity of the community. Factors other than enrichment also were shown to be important in controlling the composition and diversity of the communities. Most important of such factors were substrate types and stability and variation in discharge; these may or may not have been a result of human activity in the watersheds.

W74-03905

CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,

North Dakota State Univ., Fargo. Dept. of Zoology.

J. J. Peterka, and J. W. Held.

Available from the National Technical Information Service as PB-227 675; \$4.25 in paper copy. North Dakota Water Resources Research Institute, Report WI-312-001-72, February 1972. 18 p., 3 fig., 3 tab., 17 ref. OWRR B-001-NDAK(1). 14-00001-882.

Descriptors: *Algae control, *Eutrophication, *Limiting factors, North Dakota, Nutrients, Nitrogen, Phosphorus, Bottom sediment, Agricultural runoff, Domestic wastes, Surface runoff, Groundwater, Farm wastes, Leaching, Alcicides, Recreation, Pumping.

Identifiers: *Spiritwood Lake(N.D.), Nutrient sources, Hydrothol, Cutrine, Nutrient budget.

In an attempt to only reflect general trends, the major sources of nitrogen and phosphorus enter-

ing Spiritwood Lake, North Dakota were identified and the influence of nitrogen, phosphorus and alicides upon algal blooms determined. Of the estimated nitrogen and phosphorus entering the lake during spring runoff, 62% of the nitrogen and 95% of the phosphorus appeared to come from diffuse land surface sources (drainage from fields and grasslands). Groundwater sources of nitrogen and phosphorus may be particularly important and should be identified. Nitrogen, and to a lesser degree phosphorus, in livestock excrement are potentially important contributors to nutrient enrichment. Experiments indicated that additions of inorganic nitrogen increased algal production whereas phosphorus was inhibiting. Cutrine, the algicide most effective in field experiments, contains copper, which accumulates in bottom muds, and, being potentially toxic to organisms, should be used with utmost precaution. A relatively inexpensive procedure for removing some nutrients which accumulate near the lake bottom during late summer would be to pump this nutrient-rich water for irrigation use. It seems more feasible to reduce plant nutrient inputs than to spend money on alicides and weed harvesting programs. (Jones-Wisconsin)

W74-03906

THE ECONOMIC IMPACT OF THE BAN ON COMMERCIAL FISHING ON LAKE PICKWICK,

Auburn Univ., Ala. Dept. of Economics.

For primary bibliographic entry see Field 6B.
W74-03910

EFFECT OF ARTIFICIAL WATER AERATION ON BASIN ALGAL FLORA, (IN RUSSIAN),

Akademija Nauk URSR, Kiev. Instytut Hidrobiologii.

L. A. Sirenko, N. V. Avil'tseva, and V. M. Chernovs'ova.

Gidrobiol Zh. Vol 8, No 1, p 68-72. 1972. Illus. (English summary).

Identifiers: *Aeration(Artificial), Algae, Algal flora, Bloom, Oxygen, Saturation, Stratification, Cyanophyta.

Water aeration using bubbling systems of air results in destratification of the basin and creates a uniform oxygen saturation of the whole water column. This favors the liquidation of the stagnant zones with a low oxygen content in bottom layers. Under the effect of aeration, the character of the basin algal cenoses changes: the blue-green algae causing water 'bloom' are eliminated to a considerable extent, the development of other groups intensifies. Simultaneously a considerable improvement of water quality is observed.—Copyright 1973, Biological Abstracts, Inc.

W74-03918

YELLOW-GREEN ALGAE OF WASTES, (IN UKRAINIAN),

Kharkov State Univ. (USSR). Dept. of Lower Plants.

For primary bibliographic entry see Field 5A.
W74-03919

OHIO MUSSEL FISHERIES INVESTIGATION. PART I: MUSSEL STUDIES. PART II: WATER CHEMISTRY AND SEDIMENT ANALYSES.

PART III: PLANKTON SURVEY,

Eastern Michigan Univ., Ypsilanti.

J. M. Bates.

Available from the National Technical Information Service as COM73-10145; \$6.00 in paper copy, \$1.45 in microfiche. Ohio Division of Wildlife, Columbus; and National Marine Fisheries Service, Washington, D.C., completion report November 1970. 355 p., 142 fig., 51 tab., 40 ref., 1 append. NOAA 4-28-R. 14-17-0004-433.

Descriptors: *Ohio, *Mussels, *Fisheries, *Water chemistry, *Sediments, *Analysis, *Plankton, Management, Shellfish, Clams, Chemical analysis, Rivers, Systematics, History, Harvesting, Parasitism, Surveys, Bottom sediments, Water quality.

Identifiers: *Muskingum River(Ohio).

The Muskingum River, Ohio today supports what are probably the finest fresh water mussel stock in the world. It is completely possible that stocking programs could be instituted to reconstitute commercially valuable populations in certain streams. The present high market demand for shells has developed largely during the past two decades due directly to demand created by the Japanese cultured pearl industry. The location and extent of mussel beds, species composition and density, rate of harvest, rate of recruitment, sex, age, and size composition of populations, and other basic biological information were determined. Investigations into basic phenomena of shell formation, particularly composition of the extra-pallial fluid, were undertaken. A water quality survey dealing with 13 chemical and 5 physical parameters was conducted in the river. Introduction of dams established an aquatic environment quite different from that found in non-impounded streams, a condition well illustrated by the physical nature of the sediments. Data presented illustrate importance of the biogeochemical nature of the substrate as a regulatory factor in aquatic environments. An intensive plankton survey was pursued defining dynamics of plankton populations in the 90-mile stretch from Ellis to Marietta, Ohio. (See W74-0392 thru W74-0394) (Jones-Wisconsin)
W74-03931

OHIO MUSSEL FISHERIES INVESTIGATION. PART II: WATER CHEMISTRY AND SEDIMENT ANALYSES,

Eastern Michigan Univ., Ypsilanti.

J. M. Bates.

Ohio Division of Wildlife, Columbus; and National Marine Fisheries Service, Washington, D.C., completion report November 1970, p 109-211, 27 fig., 6 tab., 14 ref. 4-28-R. 14-17-0004-433.

Descriptors: *Ohio, *Mussels, *Fisheries, *Water chemistry, *Sediments, Rivers, Analysis, Surveys, Bottom sediments, Phosphates, Tributaries, Clams, Water quality, Dissolved oxygen, Carbon dioxide, Hardness(Water), Calcium, Conduction, Nitrates, Sulfates, Chlorides, Cations, Hydrogen ion concentration, Alkalinity, Velocity.

Identifiers: *Muskingum River(Ohio), Lowell(Ohio), Devola(Ohio), Dillon Reservoir(Ohio).

A water quality survey dealing with thirteen chemical and five physical parameters was conducted in the Muskingum River, Ohio. Introduction of dams established an aquatic environment quite different from that found in non-impounded streams. This condition is well illustrated by the physical nature of the sediments, which is a direct result of the energy level of the river at any point. The sediment is described in terms of physical size of the particles. The hydrogen ion concentration was slightly basic with an average pH of 7.8. Dissolved oxygen averaged 92% saturation and was fairly constant for the portion studied. Mussel beds were located below dams for a distance of one to two miles downstream. Physical parameters of sediments were definite factors in determining if a sufficiently large mussel population could be maintained to constitute a mussel bed. A bottom sediment study was conducted to establish differences in the physical nature of the substrate at one section of the river. Areas in which mussel beds exist were compared to areas not supporting mussel beds. Data presented illustrate importance of the biogeochemical nature of the substrate as a regulatory factor in aquatic environments. (See also W74-03931) (Jones-Wisconsin)
W74-03933

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OHIO MUSSEL FISHERIES INVESTIGATION.

PART III: PLANKTON SURVEY,

Eastern Michigan Univ., Ypsilanti.

J. M. Bates.

Ohio Division of Wildlife, Columbus; and National Marine Fisheries Service, Washington, D.C., completion report November 1970, p 220-330, 8 fig, 15 tab, 26 ref, 1 append.

Descriptors: *Ohio, *Plankton, *Rivers, Mussels, Fisheries, Density, Nannoplankton, Cyanophyta, Diatoms, Zooplankton, Chlorophyta, Surface waters, Bottom sampling, Canals, Dams, Rotifers, Systematics, Light penetration, Spatial distribution, Temporal distribution, Oxygen, Carbon dioxide, Hydrogen ion concentration, Calcium, Nitrogen, Phosphorus.

Identifiers: *Muskingum River(Ohio), Ellis(Ohio), Marietta(Ohio), Density-diversity, McConnellsburg(Ohio), Melosira, Synedra, Diatoma, Brachionus, Chlorococcales, Cyclotella, Fragilaria, Navicula.

During an investigation of mussel populations in Muskingum River, Ohio, an intensive plankton survey was conducted for one year in an attempt to define plankton population dynamics in that 90-mile stretch from Ellis to Marietta, Ohio. Physical and chemical parameter influences on observed density-diversity patterns were investigated. Plankton population of the Muskingum River was primarily: Bacillariophyceae, 14 taxa; zooplankton, 14 taxa; Chlorophyta, 83 taxa; and Cyanophyta, 15 taxa. Variations in density and diversity of this population differed not only temporally but also spatially (vertically and most important, between the upper reaches and the river mouth). These variations were apparently affected by physical factors (light, turbidity, and water level) and/or biological factors. Of the chemical parameters analyzed none were clearly limiting. Greatest variations in density occurred in Bacillariophyceae and zooplankton; they each showed two peak densities both of which occurred during the same period, but at different localities. The first peak density of the Bacillariophyceae was caused by the genera Melosira and Synedra while the second was caused by Diatoma and Synedra. Variation within the zooplankton was directly proportional to the rotifer population, specifically Brachionus, which underwent a high rate of reproduction during June. (See also W74-03931) (Jones-Wisconsin)

W74-03934

A COMPARATIVE STUDY OF PLANKTON RESPIRATION IN AN ACID POLLUTED LAKE AND ITS ACID FREE EMBAYMENTS,

West Virginia Univ., Morgantown. Dept. of Biology.

W. T. Diehl.

Proceedings of West Virginia Academy of Sciences, Vol 44, No 1, p 24-32, 1972. 4 tab, 13 ref.

Descriptors: *Plankton, *Respiration, *Acid mine water, *Reservoirs, West Virginia, Environmental gradient, Hydrogen ion concentration, Iron, Acidic water, Backwater, Chemical properties, Water pollution.

Identifiers: *Cheat Lake(W.Va.), Species diversity.

The community respiration of Cheat Lake, West Virginia, an acid polluted lake and two acid free embayments, was measured. The hypothesis was examined that plankton community respiration varies significantly between the lake and its embayments, manifested by lower community respiration in the lake. Respiration measurements were obtained by suspending dark bottles. Of the three sampling sites, Morgan's Run (pH 6 to 7) and Ruble's Run (pH 6 to 7.2) are backwaters and the water immediately above the dam is pH 3.5 to 5.8. Data analyses indicate that acid polluted waters at the dam either inhibit respiration of existing species or reduce planktonic densities, producing similar results. The following mean planktonic

community respiration rates were determined as milligrams oxygen per liter per day: 0.90 near the dam, 1.47 in Ruble's Run, and 2.42 in Morgan's Run. At the dam station it appears that acid pollution limits plankton abundance, thus producing lower community respiration rates. No acid pollution is evident in either backwater. (Jones-Wisconsin)

W74-03935

AN ECOLOGICAL EVALUATION OF A THERMAL DISCHARGE. PART II: THE DISTRIBUTION OF PHYTOPLANKTON AND PRIMARY PRODUCTIVITY NEAR THE WESTERN SHORE OF LAKE ERIE,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

M. D. Marcus.

Michigan State Univ., Institute of Water Research, Thermal Discharge Series Technical Report No. 14, May 1972. 96 p, 15 fig, 16 tab, 53 ref, 1 append.

Descriptors: *Baseline studies, *Distribution, *Phytoplankton, *Primary productivity, *Lake Erie, Diurnal, Systematics, Thermal powerplants, Water pollution, Population, Seasonal, Diatoms, Chlorophyta, Cyanophyta, Succession, Zooplankton, Light penetration, Turbidity, Phosphorus, Limiting factors, Eutrophication, Nitrogen, Nutrients, Respiration.

Identifiers: *Western Lake Erie, Species diversity, River Basin.

Baseline information is established on phytoplankton composition, productivity, and distribution. Phytoplankton populations and associated primary productivity of near shore areas of western Lake Erie are examined and compared to two shoreline areas to determine distributional variations in population parameters. Samples were collected at four week intervals May to November, 1970. Nearly 200 phytoplankton species were observed. Spring populations, dominated by diatoms, were displaced during summer by increasing green and blue-green algae. Greatest species diversities commonly occurred in inshore areas; lowest equitability was found in the River Raisin. Least phytoplanktonic volumes, blue-green algal volumes, mean individual volume, and primary productivities were generally observed in the river. Greatest phytoplankton numbers, volumes, and productivities, as well as volumes of diatoms and green algae were most frequently observed in the man-made embayment. The lake was generally intermediate in most categories but usually had least community respiration. Water temperatures appeared a major factor regulating class composition in spring and late fall. Light apparently influenced phytoplanktonic productivity through photoperiod variation and limited light penetration. Data suggest that increased nutrient enrichment leads to decreased mean individual sizes of the phytoplankton and increased species diversities; these relationships contrast with results obtained in earlier ecological studies. (Jones-Wisconsin)

W74-03936

LAKE KINNERET: PLANKTONIC POPULATIONS DURING SEASONS OF HIGH AND LOW PHOSPHORUS AVAILABILITY,

Kinneret Limnology Lab., Tiberias (Israel).

T. Berman, U. Pollinger, and M. Gophen. Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 558-598, 1972. 3 fig, 6 tab, 21 ref.

Descriptors: *Nitrogen, *Plankton, *Phosphorus, *Zooplankton, Eutrophication, Phytoplankton, Pyrrhophyta, Cyanophyta, Copepods, Crustaceans, Rotifers, Chlorophyta, Bacteria, Algae, Limiting factors, Nutrients, Chrysophyta.

Identifiers: *Lake Kinneret(Israel), Peridinium, Microcystis, Rhodomonas, Melosira, Erkenia sub-

aequiliata, Keratella cochlearis, Elakothrix gelatinosa, Cosmarium, Tetradron, Chroococcus limneticus.

Lake Kinneret serves as the primary reservoir of Israel's National Water carrier supplying over a third of the country's irrigation and drinking water. It supports an active commercial fishing industry, and, around its shores, tourist facilities are expanding. Studies suggest that, although adequate phosphorus is available during the main algal bloom period (January-May), this nutrient may become limiting in late summer and autumn. Phosphorus availability was assessed by several methods: relative phosphatase activities with p-nitrophenyl phosphate and endogenous substrates, hot water extraction of orthophosphate from plankton, and nutrient enrichment experiments. Despite seasonal changes in plankton populations, alkaline phosphatase activities were always predominantly associated with small organisms, presumably algae and bacteria. The main bloom-forming algae are generally Pyrrhophyta (*Peridinium cinctum* fa. *westii*) although occasionally Cyanophyta (*Microcystis* sp.) have predominated. Among zooplankton, maximum numbers of Copepoda, Cladocera, and Rotifera are observed at the bloom period and phosphorus appears to be abundant. However, by late summer a shortage of epilimnic phosphorus may be limiting algal growth. By then the main phytoplankton biomass consists of Chlorophyta and Cyanophyta and zooplankton numbers are minimal. (Jones-Wisconsin)

W74-03937

AN ANALYSIS OF THE ZOOPLANKTON COMMUNITY IN AN ACID POLLUTED RESERVOIR,

West Virginia Univ., Morgantown. Dept. of Biology.

J. L. Bible.

Proceedings of West Virginia Academy of Sciences, Vol 44, No 1, p 32-39, 1972. 5 tab, 17 ref.

Descriptors: *Zooplankton, *Biological communities, *Reservoirs, *Acid mine water, West Virginia. Water pollution effects, Backwater, Chemical properties, Acidic water, Hydrogen ion concentration, Hardness(Water), Alkalinity, Biomass, Conductivity, Daphnia, Crustaceans, Reservoirs.

Identifiers: *Cheat Lake(W.Va.), Brachionus cf. urceolaris, Diaptomus, Mesocyclops edax, Daphnia parvula, Ceriodaphnia, Bosmina longirostris.

Measurements at stations in the backwaters and main reservoir of Cheat Lake, West Virginia were made to determine if the stations differed significantly on the basis of chemical parameters associated with acid mine pollution. The zooplankton community was studied at each station and chemical and biological parameters were compared. Since its construction in 1929, Cheat Lake has been polluted by acid mine drainage. The reservoir's three backwaters are partially isolated from the main reservoir and do not receive acid except occasionally from the main reservoir. Sampling sites in the reservoir were opposite the coal pile, five miles above the dam, and one-quarter mile above the dam; in the backwaters they were in the middle of Rubles Run and in the middle of Morgan Run. The reservoir stations were similar with low pH and alkalinity and high methyl orange acidity, total acidity and conductivity. The backwaters were nonacid with relatively high pH and alkalinity and low methyl orange acidity, total acidity and conductivity. Community coefficients indicate zooplankton communities in the backwaters are similar but differ from zooplankton in the main reservoir. In addition, zooplankton biomass was much greater in the backwaters. (Jones-Wisconsin)

W74-03938

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

SOME ENVIRONMENTAL FACTORS DETERMINING THE PRIMARY PRODUCTION OF THE MOZHAISK RESERVOIR, (IN RUSSIAN), Moscow State Univ. (USSR).

Yu. M. Lebedev, and E. L. Shirokova.

Biol Nauki. Vol 15, No 6, p 116-118, 1972. Illus.

Identifiers: Environmental conditions, *Primary production, Reservoirs, *USSR(Mozhaisk Reservoir).

On the basis of data from observations on the Mozhaisk (USSR) reservoir in 1967-1969 an equation for calculating primary production was derived. The standard deviations between the observations and the calculated values was plus or minus 30%.—Copyright 1973, Biological Abstracts, Inc.

W74-03939

SUMMARY REPORT OF THE AGREED MONITORING PROJECTS ON EUTROPHICATION OF WATERS.

Organization for Economic Co-operation and Development, Paris (France). Water Management Section Group.

Report 89778, 1973. 21 p, 1 fig, 4 append.

Descriptors: *Eutrophication, *Water quality control, *Measurement, Hydrologic data, Monitoring, Physical properties, Chemical properties, Biological properties, Geomorphology, Ecology, Sampling, Lakes, Reservoirs.

Identifiers: *OECD, Alpine project, Nordic project, Reservoir project, North American project.

In order to further enable member countries of the Organisation for Economic Co-operation and Development to decide on the best policies for pollution and eutrophication control, a common system of measurements and monitoring of waters was established. The system of measurement was divided into three categories—physical, chemical, and biological—which are then subdivided into 'essential' and 'desirable.' This measurement system would make available reliable and quantified hydrological data. A regional approach towards eutrophication was developed, with the voluntary association of the participating institutes in four regional projects: (1) Alpine Project consisting of Austria, France, Germany, Italy, and Switzerland; (2) Nordic Project including Denmark, Finland, Norway, and Sweden; (3) Reservoir Project including Belgium, Germany, Netherlands, Spain, and the United Kingdom; and (4) North American Project including Canada and the United States. The specific bodies of water to be considered in each project are listed in Appendix II. The program will be conducted for a period of four years, with a special review and assessment planned at the end of the first year. (Pinsky-Wisconsin)

W74-03940

SPECIES DIVERSITY OF CHYDORID FOSSIL COMMUNITIES IN THE MISSISSIPPI VALLEY,

Wayne State Univ., Detroit, Mich. Dept. of Biology.

J. De Costa.

Hydrobiologia, Vol 32, No 3-4, p 497-512, 1968. 1 fig, 15 tab, 16 ref.

Descriptors: *Crustaceans, *Paleolimnology, *Mississippi River Basin, Distribution, Mathematical studies, Lakes, Oxbow lakes, Artificial lakes, Lake sediments, Eutrophication, Turbidity, Littoral, Biological communities.

Identifiers: *Species diversity, *Chydorid fossils, Diversity indices, Shannon-Weaver equation, Broken stick model.

The importance of chydorid fossil fauna to paleolimnologists prompted new analyses of earlier data. Species diversity of the chydorid fossil fauna (shells and head shields) in off shore surficial lake sediments of 45 lakes in the Mississippi Valley

ley are described. Lakes are grouped as oxbow, artificial, and 'natural' (those formed by natural means but not oxbows). Diversity was calculated according to the Shannon-Weaver information theory equation. Where diversity and equitability components were low it usually was due to Chydorus sphaericus superabundance. While the number of species seemed greater in the north, species diversity was significantly greater in the transect's southern part. Chydorid fossil populations were correlated to neither conservative parameters of the water nor sediment parameters. Populations recovered were significantly greater for the natural lakes compared with the other two groups. Species diversity was negatively correlated to population size in natural lakes, while the opposite positive correlation was found for the other lakes. Correlations found between species diversity and sedimentary parameters could be caused by high turbidity in artificial and oxbow lakes, perhaps retarding eutrophication. This factor, absent in natural lakes, has resulted in rapid eutrophication causing loss of diversity and instability in the chydorid communities. (Jones-Wisconsin)

W74-03941

PRIMARY PRODUCTION AND DESTRUCTION OF ORGANIC MATTER IN 2 LAKES OF DIFFERENT TYPES, (IN RUSSIAN),

Gorkii State Univ. (USSR). Dept. of Zoology.

M. A. Petrova, A. G. Pogodin, and T. S. Elagina.

Biol Nauk. Vol 15, No 3, p 17-20, 1972. Illus.

Identifiers: Bacteria, Lakes, *Organic matter, Phytoplankton, *Primary production, Protozoa, Respiration, *Eutrophic lake, *oligotrophic lakes.

In eutrophic and oligotrophic lakes the gross primary production is about the same, since in oligotrophic lakes the thickness of the trophogenic layer is greater and the intensity of photosynthesis decreases less markedly with depth. A secondary oligotrophic lake is considerably inferior to a eutrophic lake with respect to indices of destruction, since in an oligotrophic lake there is practically no influx of organic matter from without and little planktonogenic detritus (the substrate for the development of bacteria decomposing organic matter). The role of zooplankton in the destruction of organic matter in both lakes is small. Respectively 4.1 and 3.2% of the gross primary production of phytoplankton is expended for its respiration. Among the zooplankton the protozoa are most important in the decomposition of organic matter.—Copyright 1973, Biological Abstracts, Inc.

W74-03944

PRELIMINARY SURVEY OF GOLCUK, A EUTROPHIC MOUNTAIN LAKE IN WESTERN TURKEY,

Aegean Univ., Bornova (Turkey).

R. Geldiay and I. U. Tareen.

Ege Universitesi Fen Fakultesi Ilmi Raporlar Serisi No. 138, 1972. 21 p, 7 fig, 4 tab, 13 ref.

Descriptors: *Eutrophication, *Lakes, *Limnology, Urban drainage, Physical properties, Seston, Biomass, Productivity, Hydrogen ion concentration, Lake morphology, Phytoplankton, Agricultural runoff, Oxygen, Algae, Thermal properties, Light penetration, Zooplankton, Carbon dioxide, Aquatic plants, Systematics.

Identifiers: *Lake Golcuk(Turkey), Montane lakes.

A one year limnological study was made of Golcuk Lake, a mountain lake in western Turkey. Maximum summer temperature was 22.7°C and winter temperature was not below 4°C. Usually alkaline, it becomes acidic in September as production of carbon dioxide is immense due to photosynthetic activities of phytoplankton and waste decomposition. It is highly eutrophic due to urban drainage from an adjacent village and agricultural runoff. Hydrogen sulfide was detected in September.

Algal blooms of *Microcystis aeruginosa*, *Anabaena flos-aquae*, *Spirogyra*, and *Oscillatoria rubescens* occurred. Since the bottom is composed mainly of sand, bottom fauna were scarce in comparison with the intensive density of the zooplankton. Among the perennial species *Lionotus*, *Stenot*, *Filinia longiseta*, *Bosmina longirostris*, *Cyclops*, and *Arctodiaptomus pectinicornis* were found. Prominent among the zooplankton, *Copepoda* peaked in August. Rotifera and Cladocera showed the maxima in June. Hydrogen sulfide causes decline of zooplankton population. In 1967, 120 fish, species *Silurus gelanis*, were introduced, whereas *Cyprinus carpio* was native. *Potamogeton natans*, *Phragmites communis*, *Ranunculus aquatilis*, and *Myriophyllum verticillatum* were the most common aquatic plants. (Jones-Wisconsin)

W74-03946

NUTRIENT BUDGETS IN RIVERS,

Water Pollution Research Lab., Stevenage (England).

M. Owens, J. H. N. Garland, I. C. Hart, and G. Wood.

In: 'Conservation and Productivity of Natural Waters,' Symposia of the Zoological Society of London, No 29, p 21-40, 1972. 8 fig, 1 tab, 20 ref.

Descriptors: *Chlorides, *Nutrients, *Rivers, *Nitrogen, Water quality, Potassium, Water pollution sources, Estimating, Drainage, Agricultural runoff, Urban runoff, Forecasting, Mathematical studies, Runoff.

Identifiers: *Nutrient budget, River Great Ouse(England), River Trent(England), Inorganic nitrogen.

Major source of inorganic nitrogen and chloride in rivers draining primarily agricultural land, is drainage, whereas in urbanized and industrialized catchments, effluents are the major source. Estimations have been made of mean loads derived from land for a number of catchments in England and Wales. There is an apparent inverse relationship of the average concentrations of inorganic nitrogen and chloride in the drainage waters from these catchments to the residual runoff per unit of catchment. A simple relation between population density and land use has been used to calculate proportions of inorganic nitrogen and chloride derived from various sources within a catchment and the average and varying concentrations of these substances in the river. Throughout the year, reasonable agreement between calculated and observed chloride concentrations was obtained for the River Great Ouse and the River Trent. In both rivers, calculated concentrations of inorganic nitrogen generally exceeded those observed during summer while reasonable agreement was obtained at other times of the year. Possible explanations of this discrepancy between calculated and observed concentrations of inorganic nitrogen are discussed, including utilization by aquatic plants and algae, denitrification, and loss of gaseous ammonia. (Jones-Wisconsin)

W74-03947

PROTEOLYTIC ACTIVITY OF SAPROPHYTIC MICROFLORA IN THE DNEPRODZERZHINSKOE RESERVOIR, (IN RUSSIAN),

N. M. Karpushin, and G. B. Mel'nikov.

Gidrobiol Zh. Vol 8, No 3, p 76-79, 1972. Illus.

Identifiers: Enzymes, *Floral(Saprophytic), Pollution, Protease, *Proteolytic activity, Reservoirs, *USSR(Dneprodzerzhinskoe reservoir), Self-purification.

The potential proteolytic activity of saprophytic microflora from surface and bottom waters (Dneprodzerzhinskoe reservoir, USSR) and distribution patterns for proteolytic bacteria were investigated. Seasonal variations in the number of saprophytic microflora were shown. The potential proteolytic activity and number of proteolytic bac-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

teria did not vary substantially between surface and bottom layers. A high potential activity in the bottom zone of the lower tail bay and in the upper tail bay was shown. The dynamics of potential proteolytic activity did not correspond to the total number of saprophytes with proteolytic activity, indicating that proteolytic enzymes from deterioration of other hydrobionts, probably from blue-green algae, were present. The intensity of bacterial activity measured by the zone of proteolysis on hard medium with skim milk showed that proteolytic bacteria were powerful producers of protease and confirmed their leading role in hydrolysis of protein compounds. The potential proteolytic activity of saprophytic bacteria can be used to test for the degree and nature of organic water pollution as well as for the existence of self-purification processes.—Copyright 1973, Biological Abstracts, Inc.

W74-03949

CATASTROPHE BREWING IN QUIET WATERS,

National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 5B.

W74-04025

ROTIFER PLANKTON IN BRACKISH AND FRESHWATER LOCALITIES IN CENTRAL SWEDEN,

Uppsala Univ. (Sweden). Inst. of Zoology.
B. Pejler.

Oikos, Vol 23, No 3, p 416-419, 1972, Illus.

Identifiers: Brackish water, Freshwater, *Rotifer plankton, *Sweden, *Synchaeta gyrina.

The rotifer plankton was studied in some freshwater and brackish water localities in easternmost Central Sweden. Concerning the general character and rotifer plankton, some of the lakes agreed with the type previously studied, e.g., on the island of Gotland and designated as 'oligotrophic--highly calcareous.' Some of the lakes were recently separated from the sea, and in some others brackish water still intrudes at times. In such localities *Synchaeta gyrina* Hood was abundant. This rotifer evidently constitutes an edge species between brackish and fresh water. In the purely brackish localities, on the other hand, the species composition was similar to that found elsewhere in Baltic zooplankton.—Copyright 1973, Biological Abstracts, Inc.

W74-04041

PRIMARY PRODUCTIVITY IN RELATION TO CHEMICAL PARAMETERS IN CHEAT LAKE, WEST VIRGINIA,

West Virginia Univ., Morgantown. Dept. of Biology.
R. D. Volkmar.

Proceedings West Virginia Academy of Science, Vol 44, No 1, p 14-22, 1972. 4 tab, 15 ref.

Descriptors: *Primary productivity, *Chemical properties, *Acidic water, West Virginia, Backwater, Reservoirs, Conductivity, Hydrogen ion concentration, Alkalinity, Carbon, Acid mine water, Bicarbonates, Regression analysis, Water pollution effects, Light penetration, Oligotrophy, Nannoplankton.

Identifiers: *Cheat Lake(W. Va.).

Cheat Lake reservoir, as a result of water seepage through the numerous coal mines in the Cheat watershed of West Virginia, receives a heavy load of acid from several tributaries. Its three backwater areas have no coal mines in their watersheds, are partially isolated from the main basin, and are relatively free of mineral acid. The main lake showed high acidity and conductivity, and low pH, alkalinity, and inorganic carbon, indicating presence of acid mine wastes. The backwater areas have a pH near neutrality with low acidity and higher levels of bicarbonate al-

kalinity and inorganic carbon, indicating presence of acid mine wastes. The backwater areas have a pH near neutrality with low acidity and higher levels of bicarbonate alkalinity and inorganic carbon. Results of regression analyses showed inorganic carbon to be an important nutrient in controlling productivity in the Rubles Run backwater. As indicated by the regression equation for productivity at the dam station, the presence of mineral acid exerts considerable influence on carbon assimilation. Although the rates of carbon assimilation at the dam station and the Rubles Run backwater are not significantly different, they are influenced by different factors. Inorganic carbon was the most important variable controlling productivity in the Rubles Run backwater. (Jones-Wisconsin)
W74-04089

Identifiers: **Chlorella vulgaris*, *Polyphosphate, Overcompensation.

Variations in the polyphosphate content of *Chlorella vulgaris* cells were studied with special reference to effect of phosphate levels in the culture medium. Two polyphosphate fractions were extracted, one soluble in cold 10% trichloroacetic acid, and one insoluble in acid but soluble in cold M KOH. Cell numbers were estimated using a haemocytometer. The fractions designated as polyphosphates were characterized by barium precipitation at pH 4.5, complete acid lability, partial alkaline lability, immobility on paper chromatograms, absence of ultraviolet absorption, and metachromasy. During a period of phosphate starvation, the phosphate content of *Chlorella vulgaris* cells which had been grown in phosphate-rich solution, decreased. The levels of most phosphate fractions declined, especially those of inorganic polyphosphates. On return to a phosphate medium, phosphate was taken up at a much faster rate than before starvation, with a striking increase in acid-soluble polyphosphate. The stimulated phosphate uptake and polyphosphate increase are shown to be specific effects of phosphate starvation, occurring only when excess phosphate was supplied and required light or air for the provision of energy. There was relatively little change in the concentrations of other phosphate fractions, including orthophosphate. (Jones-Wisconsin)
W74-04094

DIET OF THE MESOCYCLOPS LEUCKARTI (CLAUS) AND LEPTODORA KINTDTII (FOCKE) POPULATIONS IN LAKE ILMEN, (IN RUSSIAN),

Gosudarstvennyi Nauchno-Issledovatel'skii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).

For primary bibliographic entry see Field 2H.
W74-04091

PRODUCTIVITY OF THE RIVER THAMES AT READING,

Reading Univ. (England). Dept. of Zoology.

A. D. Berrie.

Symposia of the Zoological Society of London, No 29, p 69-86, 1972. 7 fig, 6 tab, 16 ref.

Descriptors: *Productivity, *Ecology, Trophic level, Nutrients, Suspended load, Organic matter, Phytoplankton, Diatoms, Respiration, Benthic fauna, Benthic flora, Aquatic plants, Benthos, Mussels, Fish, Detritus, Rotifers, Crustaceans, Photosynthesis, Invertebrates, Fish management, Fecundity, Diptera, Zooplankton, Energy.

Identifiers: *River Thames(England), *Reading(England), River Kennet(England).

A stretch of River Thames was studied at all trophic levels. For most of its length it is dredged for navigation to a minimum depth of 2 m and flow is regulated by locks and weirs at about 5 km intervals. At Reading it is a eutrophic lowland river, 40 to 80 m wide, with a center mean depth of about 3 m. It carries considerable quantities of nutrients and suspended organic matter but is well oxygenated. A rich phytoplankton population develops in spring and summer usually with a spring bloom of centric diatoms. Over the year primary production of phytoplankton greatly exceeds respiration. Various aspects of the ecology of this part of the river have been studied for twelve years. Plants, invertebrates, and fish are discussed. The annual production of fish is quite high but much is attributable to young fish in their first few months when high mortality occurs; surviving fish depend heavily on allochthonous materials and organic detritus. Aquatic macrophytes provide an important habitat for the invertebrate fauna, and care should be taken to ensure their preservation. Quality of fish for angling is poor, and management techniques must be developed for improvement. (Jones-Wisconsin)
W74-04093

AN ECOLOGICAL EVALUATION OF A THERMAL DISCHARGE. PART III: THE DISTRIBUTION OF ZOOPLANKTON ALONG THE WESTERN SHORE OF LAKE ERIE,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

T. F. Nalepa.

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

Descriptors: *Baseline studies, *Distribution, *Zooplankton, Lake Erie, Water temperature, Powerplants, Systematics, Temporal distribution, Spatial distribution, Predation, Density, Canals, Water pollution, Biomass, Rotifers, Copepods, Crustaceans, Foods, Daphnia.

Identifiers: *Western Lake Erie, Raisin River(Mich), Discharge canal, Plum Creek(Mich).

Zooplankton distribution in near-shore areas of western Lake Erie were studied relative to temperature, oxygen, particulate organic carbon, primary productivity, suspended solids, and fish predation. Zooplankton density, biomass, and composition were compared in near-shore areas, a man-made discharge canal, a shallow creek embayment, and polluted River Raisin. It is apparent from relative values of biomass and density that mean biomass per individual differed among sampling stations. Individuals in the lake averaged twice the biomass of those in the discharge canal while the river was intermediate. Apparently distribution of total density and biomass are greatly affected by composition of the major taxon—rotifers, cladocerans and copepods. This, in turn, is apparently influenced by major physical or biological characteristics of the area. The fact that significant differences in biomass between depths was much more common than differences in density indicates that differences in vertical distribution of a few large species were primarily responsible for depth differences. Basic differences in zooplankton distributions were attributed mainly to variations in oxygen, food availability, and fish predation. Therefore, where abiotic conditions are tolerable, food availability and predation appear to be the most influential regulators of zooplankton in the near-shore areas of western Lake Erie. (Jones-Wisconsin)
W74-04095

THE RELATION BETWEEN THE SYNTHESIS OF INORGANIC POLYPHOSPHATE AND PHOSPHATE UPTAKE BY CHLORELLA VULGARIS,

Oxford Univ. (England). School of Botany.

P. A. Aitchison, and V. S. Butt.

Journal of Experimental Botany, Vol 24, No 80, p 497-510, 1973. 8 fig, 1 tab, 27 ref.

Descriptors: *Cytological studies, *Phosphates, *Synthesis, Chlorella, Absorption, Algae.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

NITROGEN AND PHOSPHORUS LOSSES IN SURFACE RUNOFF FROM AGRICULTURAL LAND AS INFLUENCED BY PLACEMENT OF BROADCAST FERTILIZER,
Agricultural Research Service, Morris, Minn.
North Central Soil Conservation Research Center.
D. R. Timmons, R. E. Burwell, and R. F. Holt.
Water Resources Research, Vol 9, No 3, p 658-667, 1973. 6 fig, 3 tab, 26 ref.

Descriptors: *Nitrogen, *Phosphorus,
*Agricultural runoff, Application methods, Fertilizers, Minnesota, Fertilization.

Concern has been expressed that possible nitrogen and phosphorus enrichment of surface runoff from agricultural land because of increased fertilizer use may be accelerating eutrophication of lakes and rivers. Losses of N and P occur in both the sediment and the water portions of surface runoff. Numerous Minnesota lakes are surrounded by intensively cultivated farmland. Fertilizer is often broadcast in the fall and plowed down; under some conditions fertilizer is broadcast in the spring and disked in on fields that were previously fall plowed, thus various conditions can prevail depending on management practices. From fertilized and unfertilized plots on a Barnes loam soil located in west-central Minnesota, nitrogen and phosphorus losses were determined in sediment and water components of surface runoff. Small fallow plots received uniform amounts of N and P and simulated rainfall was used to cause surface runoff. The amounts of N and P had different placement in the broadcast fertilizer. Deep incorporation of fertilizer by plowing down and subsequent disking caused N and P losses about equal to those in surface runoff from unfertilized plots. Highest nutrient losses occurred when fertilizer was broadcast on a disked surface. (Jones-Wisconsin)

W74-04096

EFFECT OF DIFFERENT SALINITIES ON GROWTH, REPRODUCTION, AMINO ACID SYNTHESIS, FAT AND SUGAR CONTENT IN ULVA FASCIATA DELILE,
Alexandria Univ. (Egypt); and Kuwait Univ.
A. F. Mohsen, A. H. Nasr, and A. M. Metwalli.
Botanica Marina, Vol 15, No 4, p 177-181, 1972. 7 fig, 4 tab, 18 ref.

Descriptors: *Salinity, *Plant growth, *Marine algae, *Reproduction, Amino acids, Synthesis, Lipids, Carbohydrates, Proteins, Temperature.
Identifiers: *Ulva fasciata.

To find the optimum salinities affecting the growth rate, reproductive phases, and maximum yield of amino acids, fats, and sugars, *Ulva fasciata*, containing high percentages of amino acids and proteins, was used. It represents a versatile alga adapted to varying degrees of salinity. Different grades of salinity ranging from 15-45 were prepared either by dilution or evaporation and back titration. Algal plants were washed with sterile sea water till all detritus was removed. Dense loads of epiphytes restricted to the stolons were peeled off. Plants were vigorously shaken with glass beads in sterile water to free them from contaminants, mainly bacteria. Growth rate of *Ulva* plants kept under 25°C differed with varying salinity concentrations, the optimum being 25. Production of zoospores or gametes was traced in salinities between 20 and 35. The most favorable limit for free amino acid synthesis varied between salinities of 20-30, with the optimum at 25. Total fat content increased with increasing salinity up to 40. Above 40, total fat content decreased. Four types of sugars (glucose, fructose, sucrose, and raffinose) increased with salinity increase up to 35. (Jones-Wisconsin)

W74-04097

EFFECT OF DIFFERENT CARBON SOURCES ON GROWTH, REPRODUCTION, AMINO ACID SYNTHESIS, FAT AND SUGAR CONTENTS IN ULVA FASCIATA DELILE,
Alexandria Univ. (Egypt); and Kuwait Univ.
A. F. Mohsen, A. H. Nasr, and A. M. Metwalli.
Botanica Marina, Vol 15, No 4, p 182-185, 1972. 4 fig, 4 tab, 17 ref.

Descriptors: *Carbon, *Plant growth, *Reproduction, *Marine algae, Amino acids, Synthesis, Lipids, Carbohydrates, Carbon dioxide, Carbonates, Bicarbonates, Organic compounds, Metabolism, Photosynthesis.
Identifiers: *Ulva fasciata, Abu Qir(Egypt), Acetate, Pyruvate.

Carbon is derived by algae from carbon dioxide, carbonate, bicarbonate or organic compounds. It is quite probable that the metabolic routes for the assimilation of carbon compounds differ in different algal groups regarding qualitative and quantitative variations in amino acid synthesis. This investigation includes a study of the effect of acetate and pyruvate as carbon precursors and their effect on amino acid synthesis in *Ulva fasciata* plants. Fresh *Ulva* plants were collected from the Abu Qir locality at the Alexandria, Egypt shore and cultured. The effect of pyruvate and acetate on growth, amino acid synthesis, fat and sugar contents was assessed. Different carbon equivalent amounts of sodium pyruvate and sodium acetate were added to the standard culture medium. Effect of carbon sources on growth and reproduction show maximum increase when pyruvate was used followed by acetate. The data representing the amino acids both qualitatively and quantitatively together with different concentrations of sodium pyruvate and acetate are illustrated and amounts of total fats under different concentrations of pyruvate and acetate are indicated. Acetate rather than pyruvate is preferred for fat production. Pyruvate is preferential for carbohydrate metabolism rather than acetate. (Jones-Wisconsin)

W74-04098

EFFECT OF LOW OXYGEN CONCENTRATION ON SURVIVAL AND EMERGENCE OF AQUATIC INSECTS,
National Water Quality Lab., Duluth, Minn.
A. V. Nebeker.
Transactions of the American Fisheries Society, Vol 101, No 4, p 675-679, 1972. 3 fig, 3 tab, 11 ref.

Descriptors: *Oxygen, *Aquatic insects, Dissolved oxygen, Larvae, Mayflies, Stoneflies, Caddflies, Midges, Mortality.
Identifiers: *Survival, *Emergence, *Tanytarsus dissimilis*, *Ephemerella simulans*, *Ephemera subvaria*, *Hexagenia limbata*, *Acronemura lycorias*, *Hydropsyche betteni*, *Pteronarcys dorsata*, *Leprotopha nebulosa*, *Baetisca laurientae*.

This study was designed to establish safe levels of dissolved oxygen for common species of aquatic insects known to be important as fish-food organisms. Both 96-hr tests and 30-day survival tests together with long-term tests (1 to 9 months) to determine effects of low oxygen on adult emergence were conducted. Safe concentrations of dissolved oxygen for survival and adult emergence of larvae of nine species of aquatic insects, including mayflies, stoneflies, caddflies, and midges, ranged from 0.6 mg/l for the midge *Tanytarsus dissimilis* to slightly less than saturation for the emergence of *Ephemerella simulans* (18.5C). All species tested were less tolerant of low oxygen concentrations for 30 days than for 96 hours (90% of *E. simulans* survived 4 mg/l for 96 hours but no adults emerged successfully). If long-term tests indicate that certain stages of the life cycles are more sensitive than others, then shorter tests covering the crucial life stage might accurately estimate the survival over greater lengths of time. Emergence tests with insects and full life cycle studies will give more accurate information of long-term response to oxygen stress. (Jones-Wisconsin)

W74-04100

A MEROMICTIC LAKE IN AUSTRALIA,
Monash Univ., Clayton (Australia). Dept. of Zoology.
B. V. Timms.
Limnology and Oceanography, Vol 17, No 6, p 918-922, 1972. 1 fig, 1 tab, 11 ref.

Descriptors: *Saline lakes, *Meromixis, *Australia, Salinity, Hydrogen ion concentration, Oxygen, Hydrogen sulfide, Stratification.
Identifiers: *West Basin Lake(Australia).

A small saline maar near Colac, Victoria, Australia has a salinity differential between the mixolimnion and monomolimnion of 40%. There are also marked differences in pH, oxygen, and hydrogen sulfide concentrations in the two zones. The lake lies in basalt which is covered by a thin layer of basaltic tuff. Monthly, and at times fortnightly, observations were made from November 1970 to August 1971 at a station in the deepest part of the lake. The mixolimnion stratified during summer and as it cooled in autumn the lake became mesothermal and finally by winter the temperature profile was inverted. Available evidence favors an ectogenic origin which was probably quite recent. Meromixis would be established by lake shrinkage and water concentration during a prolonged drought followed by flooding with freshwater during abnormally heavy rains. For meromixis to occur, flooding would have to be fairly rapid, and protection from the wind would be essential. In summary, the origin of meromixis is certainly recent, and in all probability occurred in mid-1968. Its present low stability indicates imminent destruction. (Jones-Wisconsin)

W74-04101

THE EXCRETION OF ORGANIC NITROGEN BY MARINE ALGAE IN BATCH AND CONTINUOUS CULTURE,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography; and Queen's Univ., Kingston (Ontario). Dept. of Biology.
B. S. Newell, G. Dalpont, and B. R. Grant.
Canadian Journal of Botany, Vol 50, No 12, p 2605-2611, 1972. 4 fig, 1 tab, 23 ref.

Descriptors: *Organic compounds, *Nitrogen, *Marine algae, *Cultures, Peptides, Growth rates, Chlorophyll, Diatoms.
Identifiers: *Nitrogen excretion, Polypeptide, *Dunaliella*, *Chroomonas*, *Phaeodactylum tricornutum*.

Results are presented which indicate that nitrogen compounds are excreted in significant amounts by a number of algal species belonging to divisions other than blue-green algae. The excretory products appear to have properties of low molecular weight peptide. On the basis of experiments with continuous cultures, it is concluded that this excretion of nitrogenous material is a continuous process, but there is an increase in production when cells are switched from logarithmic growth to stationary growth. Under these conditions there is a decline in average nitrogen content per cell. Production of this material was not increased by stress, such as growth rate, light, carbon dioxide, or pH changes, but only when the continuous cultures stagnated. Low rates of excretion of nitrogenous materials takes place in healthy cells growing exponentially. At the close of exponential growth and onset of senescence, excretion of nitrogen rises appreciably. It is unlikely that the levels of organic nitrogen excretion measured in these experiments would lead to increases under natural conditions where bacterial numbers would be much higher than those in these cultures. Presumably the excreted nitrogenous material could be important as a nitrogen source for such organisms. (Jones-Wisconsin)

W74-04102

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

A PROGRAMME FOR STUDIES OF THE RECOVERY OF POLLUTED LAKES. THE EFFECT OF CHEMICAL SEWAGE TREATMENT AND DIVERSION OF SEWAGE.
National Swedish Environment Protection Board, Stockholm.
C. Forsberg, B. Hawerman, and L. Ulmgren.
May 1972. 10 p, 2 fig, 1 tab, 6 ref.

Descriptors: *Lakes, *Reclamation, Sewage effluents, Chemical precipitation, Diversion, Water pollution control, Eutrophication.

Identifiers: *Lake Norrviken(Sweden), Sewage diversion.

A Swedish program is planned to elucidate effects on lakes of effluents from chemical sewage treatment plants. Conditions in many different types of recipient lakes will be analyzed. Course of recovery of several polluted lakes from which sewage effluent has been completely diverted will be studied, the efficiency of the treatment plants continuously monitored, and the nutrient loadings of lakes calculated. Preliminary selected of lakes and treatment plants to be studied are presented and research programs, for which 700,000 Swedish krona per year have been allocated, are outlined. Today in Sweden there are about 100 chemical sewage treatment plants serving 14% of the urban population. The amount of phosphorus which is presently released via sewage from rural as well as urban areas can be estimated at approximately 7000 metric tons per year. To what extent and how rapidly a polluted lake will recover when its nutrient input is lowered depends upon many factors, for example, lake size and form, length of time the water remains in the lake basin, chemical and biological character of the water, and climatic conditions. Previous nutrient loadings as well as the degree of sewage effluent diversion are also important. (Jones-Wisconsin)

W74-04105

PHOSPHATES AND THE ENVIRONMENT,
Massachusetts Dept. of Public Health, Boston.
Div. of Environmental Health.

J. C. Collins.
New England Water Works Association, Vol 86, No 3, p 209-212, 1972.

Descriptors: *Phosphates, *Detergents, New England, Eutrophication, Sewage treatment.

Effective control of eutrophication will require advanced treatment facilities for all sewage and waste waters, especially municipal, industrial, and agricultural wastes. Such facilities would minimize all important nutrients, including phosphates. Abruptly halting or radically curtailing the use of washing compounds containing phosphates would not stop eutrophication, and some proposed substitutes might introduce very serious health hazards. Reasonable limitations on the phosphate content of laundry and cleaning compounds now under consideration in Massachusetts would help control one source of phosphate in the environment, and be a useful tool in helping control eutrophication in some waters. Such reasonable limitations would permit continued sale and use of effective washing compounds, while protecting the environment against needlessly large amounts of this plant nutrient. Overemphasis on the phosphate limitation would be unfortunate because it would divert public attention and support from the basic need for constructing effective sewage treatment facilities. Attaining high water supply standards for New England water will require a balanced program of public and private expenditures for pollution control facilities and an adequate environmental surveillance effort by public health and other governmental agencies. (Jones-Wisconsin)

W74-04107

DILUTIONAL PUMPING AT SNAKE LAKE, WISCONSIN,
Wisconsin Univ., Madison; and Wisconsin Dept. of Natural Resources, Madison.
S. M. Born, T. L. Wirth, J. O. Peterson, J. P. Wall, and D. A. Stephenson.
Wisconsin Dept. of Natural Resources Technical Bulletin No 66, 1973. 32 p, 24 fig, 9 tab, 39 ref.

Descriptors: *Rehabilitation, *Lakes, *Pumping, Nutrient removal, Wisconsin, Water quality, Sediments, Groundwater, Phosphorus, Nitrogen, Chlorides, Eutrophication, Costs, Nutrients.
Identifiers: *Lake renewal, *Lake flushing, *Snake Lake(Wis.).

Among the various ways to renovate overfertile lakes is the technique of dilution or flushing. The degree of success of this renewal technology is largely a function of nutrient mass transport processes. Nutrient exclusion/dilutional pumping of small, northern Wisconsin, eutrophic Snake Lake, where nutrient inflows via direct discharge of municipal wastes had been stopped for several years with little improvement in water quality, is reported. The local geology and hydrology suggested an innovative flushing method in which nutrient-rich lake water was pumped from the lake to a nearby land disposal area, allowing dilution by influent ground waters. Soil, hydrogeologic (particularly lake-groundwater relationship), and bottom sediment nutrient transfer studies were also conducted in conjunction with the lake renewal activity. Although dilutional pumping of the lake has not 'renewed' it and severe dissolved oxygen depletion problems during two winters following pumping continue to prevent the establishment of a sport fishery, phosphorus concentrations were diluted, nitrogen and chloride levels, conductance, and color were reduced, and nuisance blooms of duckweed eliminated. Bottom sediments appear to be the major source of regenerated nutrients. (Jones-Wisconsin)

W74-04108

CHEMICAL CHANGES IN THE WATER AND ACCUMULATION STRATUM OF SOILS IN PONDS FERTILIZED WITH BEET-SUGAR FACTORY WASTES,
S. Lewkowicz.

Acta Hydrobiologica, Vol 15, No 1, p 1-49, 1973. 23 fig, 12 tab, 91 ref.

Descriptors: *Sugar beets, *Waste treatment, *Self-purification, *Sewage lagoons, *Food processing industry, Fish harvest, Primary productivity, Organic matter, Physicochemical properties, Filtration, Oxidation, Degradation(Decomposition), Carp, Turbidity, Lime, Industrial wastes.
Identifiers: *Fish ponds, *Poland.

The self-purification process of beet-sugar factory wastes in fish ponds was studied including waste mineralization, transformation, and dynamics of mineral components in the water, phytoplankton primary production and oxygen conditions, waste influence on physicochemical properties of pond sediments, and effects in the second year. The four productive ponds studied were built on silt soils and supplied with water from River Bajerka. About 1 km from the factory, they were flooded with factory wastes. These waste waters, originating from various production departments, were not homogeneous and were mixed with domestic sewage. During the first two months, wastes came directly from the factory, but in February were taken from filtration fields. The mixed sewage consisted of various recirculated waters and wastes after treatment in the Nolte biological purification plant. The filtration fields influence the physico-chemical properties of wastes thus treated. Mineralization time of wastes lasted 3-6 months depending on concentration or dilution of their organic matter. Complete disintegration of organic matter introduced with the sewage was

established, as no organic matter accumulation was found in the pond soils at the end of the season. Fish yield was several times higher in ponds fertilized with sugar factory wastes than in control ponds. (Jones-Wisconsin)
W74-04110

THE APPLICATION OF FUNDAMENTAL LIMNOLOGICAL RESEARCH IN WATER SUPPLY SYSTEM DESIGN AND MANAGEMENT,
Metropolitan Water Board, West Molesey (England). Queen Elizabeth II Reservoir.
J. A. Steel.

Symposia of the Zoological Society of London, No 29, p 41-67, 1972. 8 fig, 38 ref.

Descriptors: *Water treatment, *Potable water, *Water works, Design, Management, Water purification, Impoundments, Destratification, Algal control, Oxygenation, Phytoplankton, Biomass, Anaerobic conditions, Herbivores, Zooplankton, Daphnia, Mixing.

Those potable water treatment systems which include an impoundment stage, and are attempting to purify river water subjected to considerable fluctuating nutrient and bacterial enrichment from sewage and/or land drainage are considered. A generalized scheme of usual treatment layout units is given indicating 'waste' products. In water bodies which thermally stratify with limited hypolimnetic volumes, deoxygenation of that hypolimnia is an eventual outcome of the suppression, at or near the thermocline, of effective transport between deep oxygen sinks and superficial sources. It would be necessary to prevent stratification of the basin. Systems are now available which can, economically, supply energy at many times the rate of basins considered. These energetic capabilities can alter the impounded water's characteristics so as to affect the biota. A 'limiting' circulation depth for 'spring' diatoms is, in the waters considered, suggested to be almost 30 m. Some adverse effects of turbulence are indicated. Grazing by herbivorous zooplankton is suggested to be an important factor in reducing summer phytoplankton crops, thus husbandry of zooplankton might be desirable. A degree of 'negative feedback' might be incorporated in the system. Such design and/or management would allow some system optimization. (Jones-Wisconsin)

W74-04111

FORMATION OF CARBON MONOXIDE AND BILE PIGMENT IN RED AND BLUE-GREEN ALGAE,
Boston Univ., Mass. Dept. of Biochemistry.

R. F. Troxler, and J. M. Dokos.
Plant Physiology, Vol 51, No 1, p 72-75, 1973. 1 fig, 2 tab, 34 ref. NSF GB 20924.

Descriptors: *Biochemistry, *Rhodophyta, *Cyanophyta, *Carbon, *Pigments, Algae, Mammals, Cytological studies.
Identifiers: *Carbon monoxide, *Bile pigment, Linear tetrapyrroles, Phycocyanobilin, Porphyridium cruentum, Phycocyanin, Anacystis nidulans, Plectonema boryanum, Nostoc muscorum, Synechococcus cedarorum, Phormidium luridum, Cyanidium caldarium.

Some quantitative and kinetic parameters of carbon monoxide and bile pigment formation in five blue-green algae species and in the red alga, Porphyridium cruentum are described. Algal bile pigment was measured. Phycocyanin was purified from sonicated cells. Carbon monoxide evolved by the blue-green algal cells was quantitated by displacing the contents of the gas reservoir through a Beckman 315A infrared analyzer. Results show that carbon monoxide is a by-product of bile pigment formation in algae tested. The kinetics of carbon monoxide and phycocyanobilin formation and the 1:1 molar ratio observed

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between these compounds suggests that they arose from a common intracellular intermediate. The blue-green algae synthesized carbon monoxide and phycocyanobilin in equimolar quantities at identical rates. Porphyridium cruentum incorporated delta-aminolevulinic acid-5-C14 into phycoerythrobilin and carbon monoxide. The ratio of the specific radioactivity of phycoerythrobilin to that of carbon monoxide, and the kinetics and stoichiometry of phycocyanobilin and carbon monoxide formation suggest that linear tetrapyrroles in plants are derived by the porphyrin pathway via the intermediate formation of heme. The similarity between bile pigment production in algae and in mammalian systems is discussed. (Jones-Wisconsin)
W74-04112

AERATION AT WEIRS.

Water Pollution Research Lab., Stevenage (England).

Department of the Environment (England), Notes on Water Pollution, No 61, 1973. 4 p, 3 fig, 10 ref.

Descriptors: *Aeration, *Weirs, *Dissolved oxygen, Hydraulic structures, Water pollution control.

Identifiers: England.

Whether modification of existing weirs and other hydraulic structures as a method of oxygenation of free-flowing rivers would be worthwhile is considered. If, as a result of photosynthesis, the water arriving at a weir is super-saturated with respect to the gas exchange at the weir results in an oxygen loss from the system. Factors affecting the magnitude of the oxygen deficit ratio are water temperature, depth of receiving water, weir height, water quality, type of weir structure, and depth of water over the weir. The normal weir is only one of the wide variety of structures associated with a head loss in rivers. Some are more, and others less, effective aerators than the normal weir. Use of suitable structures can greatly enhance the distribution of dissolved oxygen in a polluted river where there are head losses at obstructions. Predictions may be made of the oxygen exchange likely to occur with falls up to 3 m. A simple weir can supply much oxygen to a polluted river, and more complex structures can provide further improvement, but where there are problems arising from algal photosynthesis it may be advisable to minimize the oxygen exchange at times of supersaturation. (Jones-Wisconsin)
W74-04113

THE MOLLUSK FAUNA OF THE BOLSHOI KARABULAK OXBOW LAKE (VOLGA DELTA), (IN RUSSIAN),
For primary bibliographic entry see Field 2H.
W74-04165

ENVIRONMENTAL SURVEILLANCE FOR RADIOACTIVITY IN THE VICINITY OF THE CRYSTAL RIVER NUCLEAR POWER PLANT: AN ECOLOGICAL APPROACH,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W74-04173

INTERIM ENVIRONMENTAL MONITORING REPORT: JANUARY-JUNE 1973,
Mound Lab., Miamisburg, Ohio.
For primary bibliographic entry see Field 5A.
W74-04174

ENVIRONMENTAL RADIOACTIVITY - ISPRA 1971,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 5B.
W74-04176

DOSE ESTIMATIONS FOR THE HYPOTHETICAL USE OF NUCLEARLY STIMULATED NATURAL GAS IN THE CHEROKEE STEAM ELECTRIC STATION, DENVER, COLORADO, Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 5B.
W74-04177

ACTIVE PHASE OF ASSIMILATION OF PLUTONIUM-239 BY THE MARINE ALGAE ASCOPHYLLUM NODOSUM,

Polyarnyi Nauchno-Issledovatel'skii i Proektnyi Institut Morskogo Rybnogo khozyaistva i Okanografii, Murmansk (USSR).
V. S. Zlobin.

Available from NTIS, Springfield, Va., as Rept. No. AEC-tr-7418. \$7.60 per copy, \$1.45 microfiche. In: AEC-Translation-7418, p 207-217, 4 fig, 4 tab, 19 ref. Trans. from Trudy Pniipimrkh, Vol 29, 1971.

Descriptors: *Phaeophyta, Marine algae, *Radioactivity effects, *Radioisotopes, *Respiration, Plant physiology, *Inhibitors, Photosynthesis, Absorption, Membranes, Cytological studies, Water pollution, Radioisotopes.

Identifiers: *Plutonium-239, Sodium cyanide, Ammonium chloride, Cadmium chloride, *Ascophyllum nodosum.

A study was made of the problem of accumulation of Pu-239 by the brown alga Ascophyllum nodosum during suppression of cell respiration. As the inhibitors sodium cyanide in a concentration of 1.10 to the minus 4th power M, ammonium chloride 10 mM and 100 mM and cadmium chloride 2 mM were used. They cause a decrease in the Pu-239 accumulation factors in dependence on the substrate on which they act. A study was made of the mechanism of this phenomenon and it was possible to establish the dependence of the intensity of cell respiration and the accumulation factor. Hypotheses are presented on the means and methods by which Pu-239 in a colloidal state penetrates through the cell membrane. (Houser-ORNL)
W74-04178

PHOTOSYNTHESIS AND THE MECHANISM OF THE ACTION OF CYANIDE ON CELL RESPIRATION AND PLUTONIUM-239 ACCUMULATION BY MARINE ALGAE,

Polyarnyi Nauchno-Issledovatel'skii i Proektnyi Institut Morskogo Rybnogo khozyaistva i Okanografii, Murmansk (USSR).
V. S. Zlobin, and M. F. Perlyuk.

Available from NTIS, Springfield, Va., as Rept. No. AEC-tr-7418. \$7.60 per copy, \$1.45 microfiche. In: AEC-Translation-7418, p 195-206, 4 fig, 3 tab, 10 ref. Trans. from Trudy Pniipimrkh, Vol 29, 1971.

Descriptors: Aquatic algae, *Phaeophyta, Marine algae, Water pollution, Radioisotopes, *Radioactivity effects, Algal toxins, Algal poisons, Inhibitors, Chemical reactions, *Respiration, Plant physiology, *Photosynthesis.

Identifiers: *Plutonium-239, Ultraphagocytosis, *Cyanide, *Ascophyllum nodosum.

Cultivation of the brown alga Ascophyllum nodosum in the control (addition of Pu-239 in a concentration n.10 to the minus 6th power microcurie) and experimental aquaria (plutonium in the same concentration and cyanide in a quantity 1.10 to the minus 4th power M) revealed a stable suppression of accumulation of an alpha-emitter by algae in the presence of an inhibitor. As a result of chromatographic separation of amino acids in plant hydrolysates the greatest activity was registered in serine-glycine (34.66%), histidine (31.94%) and alpha-alanine (10.49%). Quantitatively these acids also predominate. In the investigated samples it was established by the electrophoretic method that the tag is incorporated into hypox-

anthine and adenosine monophosphoric acid. The introduction of the cell respiration inhibitor cyanide into the energy system of algae caused a response reaction in the form of a decrease in plutonium accumulation by plant cells. It is postulated that assimilation of colloid particles of plutonium occurs as a result of ultraphagocytosis. (Houser-ORNL)
W74-04179

RADIATION REACTION OF THE ADENOHYPOPHYSIS-GONADS SYSTEM IN COLD-BLOODED ANIMALS,

Polyarnyi Nauchno-Issledovatel'skii i Proektnyi Institut Morskogo Rybnogo khozyaistva i Okanografii, Murmansk (USSR).
L. A. Kashchenko.

Available from NTIS, Springfield, Va., as Rept. No. AEC-tr-7418. \$7.60 per copy, \$1.45 microfiche. In: AEC-Translation-7418, p 166-194, 2 fig, 6 tab, 20 ref. Trans. from Trudy Pniipimrkh, Vol 29, 1971.

Descriptors: Aquatic population, Animal population, Radioactivity, *Water pollution effects, *Frogs, *Radioactivity effects, Water pollution sources, Nuclear wastes, *Gonads, Biology, *Reproduction, Chromosomes, Cytological studies.

Identifiers: *Adenohypophysis.

In experiments with local and general irradiation a study was made of the interrelated radiation reaction of the adenohypophysis and gonads (ovaries and testes) in the grass frog. Not essentially differing from the reaction of these glands in higher animals, the radiation reaction of the adenohypophysis and gonads in the frog is characterized by some specific features associated with the anatomical-physiological peculiarities of the species. These include poor reversibility of radiation damage to the testes, high morphological radioresistance of structural elements of the ovary, and high radio-tolerance and repairability of the adenohypophysis. In the example of a frog, the most important aspects have been clarified of the reaction in a system of functionally interrelated organs having universal importance: as a result of irradiation there is an impairment or a complete disruption of the functional relationship between the glands. This brings about the development of two processes which mutually supplement one another: damage to the mechanisms of the synthesis and release of hormones and damage to mechanisms responding to endogenous (hormonal) stimulators. Radiation damage develops as a process leading to system disintegration. With respect to its physiological aftereffects this process is comparable to surgical removal of the glands. (Houser-ORNL)
W74-04180

EFFECT OF X-IRRADIATION ON THE INCORPORATION OF GLYCINE-C14 IN THE TISSUE OF ATLANTIC SALMON LARVAE,

Polyarnyi Nauchno-Issledovatel'skii i Proektnyi Institut Morskogo Rybnogo khozyaistva i Okanografii, Murmansk (USSR).
V. L. Kas yanov, and N. A. Lukina.

Available from NTIS, Springfield, Va., as Rept. No. AEC-TR-7418. \$7.60 per copy, \$1.45 microfiche. In: AEC-Translation-7418, p 134-141, 3 fig, 15 ref. Trans. from Trudy Pniipimrkh, Vol 29, 1971.

Descriptors: *Atlantic salmon, *Larvae, *X-rays, Growth stages, Absorption, Measurement, Fish, Animal physiology, Cytological studies, Control, *Radioactivity effects.

Identifiers: *Liver(Fish), *Skeletal muscle(Fish).

Atlantic salmon (*Salmo salar L.*) larvae at an age of one day after hatching were irradiated by X-rays in a dose of 350 R. One, four and eight days after irradiation the larvae were placed for 16

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hours in an aqueous solution of glycine-C14 with a given concentration. The degree of incorporation was judged from the number of grains of reduced silver on radioautographs of sections of the liver and skeletal muscles (over an area of 100 x 100 u). The incorporation of glycine-C14 into the tissues of irradiated larvae was greater than its incorporation into these same tissues of control larvae at all research times (the difference was statistically significant). The incorporation of glycine-C14 into the liver for an identical area of section is greater in comparison with incorporation into the skeletal muscles both in the control and in the experimental samples. (Houser-ORNL)

W74-04181

NATURAL RADIATION LOADS ON THE EGGS OF MARINE AND FRESH WATER ORGANISMS.

Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).

V. N. Podymakhin.

Available from NTIS, Springfield, Va., as Rept. No. AEC-tr-7418. \$7.60 per copy, \$1.45 microfiche. In: AEC-Translation-7418, p 142-156, 1 fig, 4 tab, 21 ref. Trans. from Trudy Pniproimrko, Vol 29, 1971.

Descriptors: *Atlantic salmon, *Radioactivity, Water pollution, *Water pollution effects, *Fish eggs, Embryonic growth stages, Cytological studies, Environmental control, Productivity, Radioisotopes, Carbon, Radium radioisotopes, Uranium radioisotopes.

Identifiers: Thorium.

An approximate method is proposed for computing the energy of beta radiation absorbed by eggs under different natural conditions with allowance for the geometric peculiarities of the object. Using the derived expressions, the absolute values of the radiation loads are computed from the natural radioactive isotopes present in sea and fresh water. The derived formulas can also be used for computing the doses from artificial radionuclides. (Houser-ORNL)

W74-04182

EFFECT OF INCORPORATED RADIONUCLIDES ON THE CHROMOSOMAL APPARATUS OF MARINE FISH.

Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).

V. G. Tsytugina.

Available from NTIS, Springfield, Va., as Report No. AEC-tr-7418. \$7.60 per copy, \$1.45 microfiche. In: AEC-Translation-7418, p 157-165, 1 fig, 3 tab, 20 ref. Trans. from Trudy Pniproimrko, Vol 29, 1971.

Descriptors: *Radioactivity, Water pollution, *Water pollution effects, *Marine fish, *Strontium, Toxicity, Embryonic growth stages, Larvae, *Chromosomes, Cytological studies, Food chains, Public health, *Fish eggs.

Identifiers: *Yttrium, Chromosomal aberrations.

The fertilized eggs of *Scorpaena porcus* L. and *Rhombus maecticus* Pall. were incubated in solutions of radionuclides strontium-90 + yttrium-90, strontium-89 and yttrium-91 in the range of concentrations 10 to the minus 11th power - 10 to the minus 5th power curie/liter. In the gastrula and one-day prolarva stages the material was fixed and pressed acetoxyein specimens were prepared. Anaphases and telophases with chromosomal impairments were detected. A high radiosensitivity of the embryos of sea fish was noted: a reliable damaging effect was already noted in concentrations of radionuclides 10 to the minus 10th power curie/liter to 10 to the minus 5th power curie/liter. There was a close correlation between the degree of chromosomal damage and the gravity of radiation damage to prolarvae. (Houser-ORNL)

W74-04183

HEALTH EFFECTS OF ELECTRICITY GENERATION FROM COAL, OIL, AND NUCLEAR FUEL.

Carnegie-Mellon Univ., Pittsburgh, Pa. Graduate School of Industrial Administration.

L. B. Lave, and L. C. Freeburg.

Available from Supt. of Doc., Gov. Printing Office, Washington, D.C., \$1.85 per copy. Nuclear Safety, Vol 14, No 5, p 409-428, Sept-Oct 1973. 2 tab, 123 ref.

Descriptors: *Electric power, Electric powerplants, Effluents, Air pollution, Water pollution, *Air pollution effects, *Water pollution effects, *Public health, *Coals, *Oil, Uranium radioisotopes, Radioactivity, Cost-benefit theory, Comparative benefits, Comparative costs, Comparative productivity.

Identifiers: *Nuclear fuels.

Occupational- and public-health effects of generating electricity from coal, uranium, and oil are compared, with particular attention given to accident and chronic-disease rates for fuel extraction and airborne emissions from power and reprocessing plants. It is concluded that uranium offers less of a health hazard as fuel than coal. The analysis is based on current operating practice; however, advances in technology can be expected to reduce both the occupational and public-health risks from these fuels. (Houser-ORNL)

W74-04184

UPTAKE AND TRANSLOCATION OF SR BY ZEA MAYS,

California Univ., Berkeley. Dept. of Soils and Plant Nutrition.

R. Handley, and K. L. Babcock.

Radiation Botany, Vol 13, No 5, p 273-281, Nov 1973. 3 fig, 4 tab, 20 ref.

Descriptors: *Corn(Field), *Radioactivity, *Radioisotopes, *Strontium, *Cesium, *Absorption, *Plant growth, Plant morphology, Resistance, Root system, Attractants, Metabolism, Ion exchange, Membrane processes, Osmosis, Reverse osmosis, Cytological studies, Potassium, Calcium.

The uptake of Sr by maize-root segments representing the whole root system is strongly temperature dependent but a large non-metabolic component apparently involving adsorption within the cell membranes is indicated. About 60 per cent of the Sr taken up under conditions permitting metabolism is resistant to elution. K in the ambient solution at a concentration amounting to 20 per cent of the Sr concentration essentially abolishes metabolic uptake. Non-metabolic Sr uptake is little affected by this K concentration. The inhibitory effect of Ca on Sr uptake is less than that of K and largely exerted on the non-metabolic phase. This inhibitory effect is countered to some degree by the ability of Ca to hinder the entry of Sr into the xylem and so its loss via the cut ends of the root segments. In whole-plant experiments K depressed root concentrations of Sr more than shoot concentrations indicating that the inhibition is exerted mainly at the tonoplasts of cortical cells. Ca had a smaller effect than K which was mainly evident in greater root retention of Sr. (Houser-ORNL)

W74-04187

IMPACT OF A POWER PLANT ON A SUBTROPICAL ESTUARINE ENVIRONMENT,

Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.

A. Thorhaug, D. Segar, and M. A. Roessler.

Marine Pollution Bulletin, Vol 4, No 11, p 166-169, Nov 1973. 2 fig, 2 tab, 15 ref.

Descriptors: *Nuclear powerplants, *Fossil fuels, *Electric power, Water pollution effects, Water pollution sources, Effluents, Water releases, *Cooling water, Water circulation, Meteorology, Mineralogy, Carbonates, Sediments, Clays, *Estuarine environment, Estuaries, Gulfs, Sounds, Bays, Atlantic Ocean, *Florida, *Thermal pollution.

Identifiers: Barnes Sound, Card Sound, *Biscayne Bay(Fla).

The development of electricity generating stations around Biscayne Bay, Florida has resulted in a considerable discharge of cooling water into this subtropical sea. The impact of this on the biology of the area has been studied for the last four years by a team of scientists; their general conclusions are summarized. Detail is given for the water circulation pattern for the area, mineral concentration of the water, vegetation studies, and the impact on animals. (Houser-ORNL)

W74-04189

FLUX OF Ce-141 THROUGH A EUPHAUSIID CRUSTACEAN,

International Lab. of Marine Radioactivity, Monte Carlo (Monaco).

S. W. Fowler, M. Heyraud, L. F. Small, and G. Benayoun.

Marine Biology, Vol 21, No 4, p 317-325, Aug 1973. 6 fig, 2 tab, 24 ref.

Descriptors: Marine animals, Environmental effects, *Water pollution effects, Radioactivity, *Radioactivity effects, Radioisotopes, Absorption, Aquatic populations, Equilibrium, Productivity, *Crustaceans, *Path of pollutants.

Identifiers: *Cerium.

The role of the Mediterranean euphausiid *Meganyctiphanes norvegica* in the cycling of radiocerium (Ce-141) was examined. When uptake of Ce-141 occurs directly from the water, a 'dynamic' population equilibrium is reached at a concentration factor of about 250. Molting was responsible for up to 99% loss of total body burden at first molt, and about 45% of the remaining activity at second molt, thus denying true longterm equilibrium to individual animals. Fecal pellets did not contain measurable Ce-141 activity when the euphausiids accumulated the isotope from water, thus proving that surface adsorption was the key accumulating process from water. When radiocerium was taken in through ingestion of labelled Artemia, about 99% of the body burden was voided as fecal pellets. Excretion by this route was accelerated when euphausiids were fed non-radioactive Artemia during loss phase. Radioactive counts of the pellets confirmed that all ingested Ce-141 was lost through defecation. When Ce-141 was ingested as labelled phytoplankton, a substantial fraction of the total body burden occurred in the molts, which indicated that the phytoplankton loss Ce-141 to the water and the radioactivity was subsequently absorbed to outer surfaces of the euphausiids. (Houser-ORNL)

W74-04191

PRIMARY PRODUCTIVITY IN THE CRAPINA-JIJILA LAKE-COMPLEX (DANUBE FLOODED AREA) DURING SEVERE FLOODING,

Bucharest Univ. (Romania). Faculty of Biology.

L. Gavrilă, I. Chiosila, and A. Schneider.

Arch Hydrobiol Suppl. Vol 44, No 1, p 10-23, 1972. English summary.

Identifiers: Danube area, Flooding, Lakes, *Phytoplankton, *Primary productivity, *Romania(Crapina-Jijila Lake Complex).

The work involved quantitative and qualitative studies of phytoplankton, together with measurement of primary productivity and of physical and chemical conditions. Investigations were made in 2 different ecological systems: Jijila, which is intensively cultivated and Crapina which is not. The

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

balance of primary plankton production had positive values in both systems. In Lake Jijila the primary production was higher and the bio-mass of phytoplankton was greater. This was attributed to the more intense cultivation.—Copyright 1973, Biological Abstracts, Inc.
W74-04194

INCREASING THE PROCESSING RATE OF PARTICULATE ORGANIC MATTER IN STREAMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5B.
W74-04202

EFFECTS OF TEMPERATURE CHANGE ON IRRIGATION RATE IN ARENICOLA MARINA (L.),
Hull Univ. (England). Dept. of Zoology.
M. K. Seymour.
Comparative Biochemistry and Physiology, Vol 43A, No 3, p 553-564, 1972. 6 fig, 29 ref.

Descriptors: *Temperature, *Water temperature, *Animal behavior, *Animal pathology, Analytical techniques, Laboratory studies, Respiration, Bioassay, Environmental effects, Laboratory animals, Marine animals, Metabolism, Environmental effects, *Worms, Invertebrates.
Identifiers: *Arenicola marina(L.).

The effects of slow and rapid temperature fluctuations on the rate of burrow irrigation in *Arenicola marina* (L.) have been studied using pressure and impedance recording techniques. With slow temperature change (2 degrees C/hr) irrigation rate rises very slowly up to 10C, faster between 10 and 14C, more slowly up to 18C and drops sharply above 18C. The total number of irrigation waves, frequency of exposure of the gills and substantially the volume of water pumped vary as does the rate/temperature curve. Despite the characteristic rate change with gradual temperature change there is a compensatory response to quickly changed temperature which shows marked overshoot and oscillation. Removal of the ventral nerve cord in a segment stops all irrigation movement in that segment. After nerve cord section in the mid trunk, the rate of each half of the trunk is dictated independently by the environmental temperature of that half; it is probably the irrigation pacemaker mechanism in the cord which responds to a change in temperature by a change in rate. (Oleszkiewicz-Vanderbilt)
W74-04225

THE OXYGEN CONSUMPTION OF CHIRONOMID LARVAE FROM LOCH LEVEN IN RELATION TO TEMPERATURE,
Stirling Univ. (Scotland). Dept. of Biology.
A. McFarlane, and D. S. McLusky.
Comparative Biochemistry and Physiology, Vol 43A, No 4, p 991-1001, 1972. 6 fig, 7 tab, 14 ref.

Descriptors: *Oxygen requirements, *Temperature, *Larvae, *Diptera, Biochemistry, Insects, Oxygen, Thermal pollution, Animal behavior, Environmental effects, Bioindicators, Water temperature, Europe, Sediments, Dredging, Lakes.
Identifiers: Acclimation, *Scotland(Lock Leven), *Chironomid larvae.

The oxygen consumption of four genera (*Stictochironomus*, *Glyptotendipes*, *Polyphemidium* and *Chironomus*) of Chironomid larvae from Loch Leven has been measured. Measurements have been made at 5, 10 and 15C, on animals both acclimated and non-acclimated to these temperatures. A marked effect of temperature on oxygen consumption has been noted with oxygen consumption increasing with higher temperature but no acclimation effect has been demonstrated. (Oleszkiewicz-Vanderbilt)
W74-04228

W74-04226

RESPIRATORY AND CIRCULATORY RESPONSES IN A HEMOGLOBIN-FREE FISH, CHAENOCEPHALUS ACERATUS, TO CHANGES IN TEMPERATURE AND OXYGEN TENSION,

Scripps Institution of Oceanography, La Jolla, Calif. Physiological Research Lab.
E. A. Hemmingsen, and E. L. Douglas.
Comparative Biochemistry and Physiology, Vol 43A, No 4, p 1031-1043, 1972. 6 fig, 44 ref.

Descriptors: *Fish behavior, Temperature, *Respiration, Circulation, Oxygen, *Oxygen requirements, Environmental effects, Water pollution effects, Animal physiology, Thermal stress, Thermal pollution, *Water temperature, Stress.
Identifiers: *Chaenocephalus aceratus, Hypoxia, *Blood pressure.

Dorsal aortic and caudal venous blood pressures, pO₂, pCO₂, pH, and lactic acid were monitored in unrestrained specimens of *Chaenocephalus aceratus*. The aortic blood pressure was exceptionally low (about 12/8 mm Hg) as was the blood lactic acid concentration (about 3 mg/100 ml at rest). The other parameters were similar to those of other fish. The effects of hypoxia were also examined. The oxygen consumption increased gradually from 1 to 4 degrees C, but then remained almost constant up to 10 C. The critical water pO₂ (40-45 torr) was little affected by increased temperatures. The viscosity of the blood was very low (about 2.91 centistokes at 0C); this aids the increased circulation in the chaenichthyids. (Oleszkiewicz-Vanderbilt)
W74-04227

THE EFFECT OF THE BRUNNER ISLAND STEAM ELECTRIC STATION'S CONDENSER DISCHARGE WATER ON THE AQUATIC LIFE IN THE SUSQUEHANNA RIVER,
Pennsylvania Power and Light Co., Allentown.
H. F. Hatfield, M. G. Pfeiffer, and C. B. Wurtz.
American Society of Mechanical Engineers, Publication Number 66-WA/PWR-10, 1966. 11 p, 6 fig, 2 tab.

Descriptors: *Heated water, Growth, Mortality, *Condensers, *Diatoms, *Bioindicators, Electric power production, Thermal power-plants, Effluents, Aquatic environment, Environmental effects, Aquatic animals, Analytical techniques, Aquatic micro-organisms, Temperature, Microscopy, *Pennsylvania, Algalides, Disinfection, Slime, *Thermal pollution, Water pollution effects.
Identifiers: *Susquehanna River.

A study undertaken to determine the effects of an electric power plant's warm water discharges on the aquatic environment is presented. A 300 mw facility located at Brunner Island on the Susquehanna River is using some 240 cu ft/sec of river water for condenser cooling. The river has an average annual flow of 34,000 cu ft/sec with a minimum flow of 1700 cu ft/sec. Diatoms were used as indicators in this study. Microscope slides were placed in different locations to collect organisms and were changed every two weeks. Two thousand slides were exposed and examined. Graphical analysis indicated a preponderance of diatoms falling between 70F and 90F. Diatoms in the cooling water were killed by heat shock during most of the year. However, when the inlet water temperature was over 55F and outlet temperature was below 93F diatom growth in the discharge canal was greater than at any other point in the river. Chlorine concentrations did not seem to affect diatoms. Variables have been identified for predicting diatom numbers under the conditions at the Brunner Island plant site. (Jerome-Vanderbilt)
W74-04229

A TECHNIQUE FOR SIMULTANEOUS ECHO LOCATION OF FISH AND THERMAL PLUME MAPPING,
Argonne National Lab., Ill.

For primary bibliographic entry see Field 5B.
W74-04229

TEMPERATURE AND PHYTOPLANKTON GROWTH IN THE SEA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.

R. W. Eppley.
Fishery Bulletin, Vol 70, No 4, p 1063-1085, 1972, 9 fig, 6 tab, 100 ref.

Descriptors: *Water temperature, *Phytoplankton, *Marine microorganisms, *Growth rates, Aquatic productivity, Photosynthesis, Assimilation, Plankton, Oceans, Water temperature, Chlorophyll, Marine plants, Aquatic environment, Water pollution, Chlorophyll, Euphotic zone, *Sea water.
Identifiers: *Carbon-chlorophyll ratio.

The variation in growth rate with temperature of unicellular algae suggests that an equation can be written to describe the maximum expected growth rate for temperatures less than 40C. Measured rates of phytoplankton growth in the sea and in lakes are reviewed and compared with maximum expected rates. The assimilation number (i.e., rate of photosynthetic carbon assimilation per weight of chlorophyll a) for phytoplankton photosynthesis is related to the growth rate and the carbon/chlorophyll a ratio in the phytoplankton. Since maximum expected growth rate can be estimated from temperature, the maximum expected assimilation number can also be estimated if the carbon/chlorophyll a ratio in the phytoplankton crop is known. Assimilation numbers for Antarctic seas are low as would be expected from the low ambient temperatures. Tropical seas and temperate waters in summer of ten show low assimilation numbers as a result of low ambient nutrient concentrations. However, coastal estuaries with rapid nutrient regeneration processes show seasonal variations in the assimilation number with temperature which agree well with expectation. (Oleszkiewicz-Vanderbilt)
W74-04233

REGULATION OF BRAIN AND EYE TEMPERATURES BY THE BLUEFIN TUNA,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.

D. S. Linthicum, and F. G. Carey.
Comparative Biochemistry and Physiology, Vol 43A, No 2, p 425-433, 1972, 4 fig, 1 tab, 12 ref.

Descriptors: *Temperature, *Marine fish, *Regulation, *Fish physiology, Animal metabolism, Biology, Water temperature, Metabolism, Animal physiology.
Identifiers: *Tuna(Bluefin).

The brain and eye of bluefin tuna (*Thunnus thynnus*) are warmer than the water. In fish from 20C water, brain temperatures averaged about 27C, eye temperatures about 26C and maximum muscle temperatures about 30C. Brain, eye and muscle temperatures are regulated so that there is only a 5-6 C variation over the water temperature range of 7-23C. A counter-current heat-exchange system in the blood supply to the brain and eye allows metabolic heat to accumulate in these organs and raise their temperatures. (Neszkiewicz-Vanderbilt)
W74-04239

BODY HEAT DISSIPATION AND CONSERVATION IN TWO SPECIES OF DOLPHINS,
California State Coll., Hayward. Dept. of Biological Sciences and Health Sciences.

S. M. McGinnis, G. C. Whittow, C. A. Ohata, and H. Huber.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

Comparative Biochemistry and Physiology, Vol 43A, No 2, p 417-423, 1972. 9 fig, 7 ref.

Descriptors: *Temperature, *Marine animals, *Animal physiology, Heat, Heat flow, Heat budget, *Animal metabolism, Biology, Insulation, Pacific Ocean, Water temperature, Oceans, Heat transfer, *Mammals.

Identifiers: *Dolphins.

Deep core, body subcutaneous and dorsal fin subcutaneous temperatures were continuously recorded via radio-telemetry from an unrestrained Hawaiian spinner and Pacific bottlenose dolphin. Body subcutaneous temperatures were several degrees Centigrade below deep core whereas dorsal fin subcutaneous temperatures were far more variable. At low water temperatures body wall insulation increased whereas dorsal fin insulation failed to rise above the lower values exhibited by the body wall. The body wall serves as a flexible insulator while the dorsal fin is a major site of heat dissipation. (Oleszkiewicz-Vanderbilt) W74-04240

THE EFFECT OF CHANGES IN AMBIENT TEMPERATURE ON SPONTANEOUS ACTIVITY IN SKIPJACK TUNA,

Hawaii Univ., Honolulu. Dept. of Zoology.
E. D. Stevens, and F. E. J. Fry.

Comparative Biochemistry and Physiology, Vol 42A, No 3, p 803-805, 1972, 1 fig, 5 ref.

Descriptors: *Marine fish, *Temperature, *Lethal limit, Fish, Environmental effects, Fish physiology, Biology, Fish behavior, Heat, *Water temperature, Oceans, Physiology, Movement.

Identifiers: *Tuna(Skipjack).

One factor in regulation of body temperature in skipjack tuna involves the regulation of the heat production by varying the level of spontaneous swimming activity in the face of changes in ambient temperature. The spontaneous activity of skipjack tuna tended to remain unchanged in the face of a gradual decrease in ambient temperature from 24 to 16°C. One fish cooled further showed a rapid decline in activity at 14°C and died at 13°C. In the temperature range tested, skipjack tuna can only maintain a constant temperature differential between body and ambient temperature. Regulation of constant body temperature appears possible only above an ambient temperature at 25°C through a decrease in the level of spontaneous activity. (Oleszkiewicz-Vanderbilt)

W74-04241

HEATING AND COOLING RATES IN FOUR SPECIES OF TURTLES,

Florida Univ., Gainesville. Dept. of Physiology.
D. C. Spray, and M. L. May.

Comparative Biochemistry and Physiology, Vol 41A, No 3, p 507-522, 1972, 4 fig, 3 tab, 36 ref.

Descriptors: *Turtles, *Cooling, *Heating, *Temperature, *Animal physiology, Bioassay, Biology, Conduction, Heat balance, Metals, Insects, Physiology, Animal behavior, *Reptiles.

Two basking turtles, *Chrysemys picta* and *Pseudemys scripta*, heat significantly faster than they cool. Two terrestrial species, *Gopherus polyphemus* and *Terrapene carolina*, cool significantly faster than they heat. The rate of heat exchange in dead basking turtles is the same as the cooling rate in living animals; dead terrestrial turtles have rates of heat exchange similar to their living heating rates. After section of the dorsal roots of the spinal nerves innervating its carapace, *Chrysemys* rate of heat exchange in both directions is similar to its rate of heating before section. These rates of heating and cooling have been compared with other rates in the literature and equations relating the rate of heat exchange to body weight of reptiles from different habitats have been calculated. The findings are interpreted

as suggestive of active control of conductance, utilized differently by turtles from two diverse habitats. (Oleszkiewicz-Vanderbilt)
W74-04243

SEASONAL VARIATION IN HEART RATE RESPONSE TO CORE TEMPERATURE CHANGES,

Indiana Univ., Bloomington. Dept. of Anatomy and Physiology.
E. C. Miller, and S. Mizell.

Comparative Biochemistry and Physiology, Vol 42A, No 3, p 773-779, 1972, 4 fig, 1 tab, 6 ref.

Descriptors: *Temperature, *Frogs, *Animal pathology, *Bioassay, Distribution patterns, Physiology, Biology, Environmental effects, Water temperature, Lakes, Seasonal, Diurnal distribution, Metabolism.

The heart rate of normal, intact, unrestrained, unanesthetized, adult male *Rana pipiens* was studied over a range of core temperatures (16-32°C) throughout a 12-month period. During the summer, heart rate response to increasing temperature was linear with a slope of 4.5. During the winter, the heart rate response was linear with a slope of 2.9 up to a core temperature of 26°C. At temperatures above this point the response was not as large with a calculated slope of 1.61. Also the linearity above 26°C was not as marked. During intermediate months the response was intermediate with no predictable patterns. (Oleszkiewicz-Vanderbilt)
W74-04244

DIEL VARIATION IN THE THERMAL TOLERANCE OF LITORIA GRACILENTA (ANURA: HYLIDAE),

University of New Zealand, Armidale (Australia).
Dept. of Zoology.
C. R. Johnson.

Comparative Biochemistry and Physiology, Vol 41A, No 4, p 727-730, 1972, 1 fig, 2 tab, 14 ref.

Descriptors: *Temperature, Heat, *Amphibians, *Resistance, *Thermal stress, Animal pathology, Biology, adaptation, Physiology, Pathology, *Australia, *Diel migration.

Identifiers: *Litoria gracilenta, *Anurans.

Critical thermal maxima (CTM) were determined at various intervals during the diel cycle for *Litoria gracilenta* acclimated at 15 and 25°C in Australia. The CTM fluctuates over a 24-hr period with significant differences occurring among testing periods for both acclimation temperatures. Data are given for other species of Australian anurans and suggest that daily variations in heat resistance may be widespread in anurans. (Oleszkiewicz-Vanderbilt)
W74-04245

ORGANIC MATTER OF THE SOIL IN THE KIEV RESERVOIR AND ITS ROLE IN THE DEVELOPMENT OF BENTHIC ALGAE, (IN RUSSIAN),

Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
L. V. Skorik, K. S. Vladimirova, G. A. Enaki, and I. K. Palamarchuk.

Gidrobiol Zh Vol 8, No 3, p 82-86, 1972. Illus.

Identifiers: Algae, Amino-Acids, *Benthic algae, Color, Diatoms, Euglena, *Organic matter, Reservoirs, Soils, *USSR(Kiev reservoir), Cyanophyta, Chlorophyta, Phylogenesis.

The role of bottom soil in the accumulation of the phytomicrobenthic biomass, consisting of diatoms, blue-green and green algae and Euglena was investigated. A direct relationship was found between the content of hydrolyzed forms of organic matter and the biomass of bottom phytocenoses. A study of the effect of amino acids

on the development of phytomicroceneses and the relationship among biomass, water color and amino acid content in soil extracts showed that the algae had a positive reaction to amino acids as a N source. It was concluded that phyto-groupings of algae were determined by the dynamics of water movement and organic matter in its hydrolyzed form.—Copyright 1973, Biological Abstracts, Inc. W74-04281

PRIMARY PRODUCTION OF PHYTOPLANKTON AND DESTRUCTION OF ORGANIC MATTER IN THE PRUT RIVER, (IN RUSSIAN),

V. M. Shalar', and A. A. Untura.
Izv Akad Nauk Mold SSR Ser Bio Khim Nauk. 3, p 3-7, 1972.

Identifiers: *Organic matter, Photosynthesis, *Phytoplankton, *Primary production, Rivers, Seasonality, *USSR(Prut River), Waste water.

Results are presented of seasonal investigations of the primary production of phytoplankton and destruction of organic matter in the Prut River (USSR). The entire length of the river was investigated. The rate of photosyntheses in the river is rather high and differs in individual stretches. The magnitude of primary production of phytoplankton on the whole increases downstream as the biomass increases, but the increase of primary production is not proportional to the increase of the biomass. An adverse effect of the waste waters of the city of Chernovtsi on the rate of photosynthesis of phytoplankton was noted.—Copyright 1973, Biological Abstracts, Inc. W74-04284

UTILIZATION OF AROMATIC COMPOUNDS BY BENTHIC MICROORGANISMS OF A EUTROPHIC LAKE,

Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.

E. Strzelczyk, W. Donderski, and W. Lewosz.
Acta Microbiol Pol Ser B Microbiol Appl. Vol 4, No 4, p 191-200, 1972.

Identifiers: *Aromatic compounds, Benthos, *Eutrophic lakes, *Microorganisms, Eutrophication.

Studies were carried out on the capability of utilizing different aromatic compounds by benthic microorganisms isolated from 2 types of bottom sediment of an eutrophic lake. The 'dy' mud harbored more organisms capable of attacking the individual aromatics applied than the sandy sediment. The non-chromogenic microorganisms were able to utilize more aromatic substances than the chromogens isolated from the 'dy' sediment, but a reverse phenomenon was observed with the sandy sediment isolates. The microorganisms utilizing aromatic compounds as the sole source of C were identified to the generic level.—Copyright 1973, Biological Abstracts, Inc. W74-04295

CHLOROPHYLL-A AND PHEOEPHYTIN: THEIR RELATIONSHIPS WITH THE CONCENTRATIONS OF NITROGEN AND PHOSPHORUS IN THE SESTON OF LAKE MONATE (NORTH ITALY), (IN ITALIAN),

European Atomic Energy Community, Ispra (Italy). Biology Div.

M. F. Baudouin, and O. Ravera.
Ann Limnol. Vol 8, No 1, p 1-10, 1972. Illus. English summary.

Identifiers: Asterionella-Formosa, Ceratium-Hirudinella, *Chlorophylla, Fragilaria-Crotonensis, Lakes, *Nitrogen, *Pheophytin, *Phosphorus, Phytoplankton, Seasons, *Seston, *Italy(Lake Monate).

The absence of a correlation between dry weight and concentrations of chlorophyll, N and P is probably due to the presence of animal and mineral detritus in the nannoseston of Lake

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Waste Treatment Processes—Group 5D

Monate. In spite of this, chlorophyll concentration gives an indication of the amount of phytoplankton in a body of water. The 3 peaks in chlorophyll concentration during the year (spring, summer and autumn) are due respectively to the following species: *Asterionella formosa*, *Ceratium hirundinella* and *Fragilaria crotonensis*. The spring bloom is the most important and chlorophyll a concentration is more than 25 mg/m³ at a depth of 7 m. The concentration of pheophytins increases with depth and season (maximum in summer). It was possible to utilize the relationship suggested by Lorenzen (1970), and calculate the mean concentration of chlorophyll/m² from analyses of samples collected at given depths.—Copyright 1973, Biological Abstracts, Inc.

W74-04300

5D. Waste Treatment Processes

THE IMPACT OF WATER POLLUTION ABATEMENT ON COMPETITION AND PRICING IN THE ALABAMA PAPER INDUSTRY

Auburn Univ., Ala. Water Resources Research Inst.

N. K. Modani, and W. H. Holley, Jr.

Availability from NTIS as PB-227 279 \$5.50 in paper copy, \$1.45 in microfiche. Water Resources Research Institute Bulletin 13, 1973, 174 p, 3 fig, 37 tab, 51 ref. OWRR C-3292 (No 3715)(3).

Descriptors: *Alabama, *Economic Impact, Industrial wastes, Marketing, *Pollution abatement, *Prices, *Pulp and paper industry, Treatment facilities, Cost analysis, Competitive prices, *Competition.

To assess the impact of water pollution abatement on competition and pricing in the Alabama paper industry, data were derived through two main sources: the manufacturers and the purchasers. The capital and operating costs of water pollution abatement equipment were allocated per unit of output to determine the additional costs per unit for water pollution abatement. Based on this and the products each of the firms produced, the possible weighted average cost increase per unit of production was estimated using a mathematical model for each of the ten major product sectors. This estimated cost increase was less than 2 percent of the average wholesale product price for all the product sectors. All the manufacturers revealed that these additional costs will be passed on to their purchasers, if and when possible. The majority of intermediate purchasers—dealers and converters—did not anticipate shifting to another domestic supplier as long as the price increase from their present supplier was 3 percent or less than the current market price. Further, the purchasers did not anticipate shifting to a foreign supplier as long as the price increase from their present supplier was 6 percent or less than the current market price on the international market. The majority of purchasers revealed that they will pass on all price increases from their manufacturers to their customers. (See also W74-01101; W74-02437 and W74-03753)

W74-03752

THE ECONOMIC BENEFITS OF ABATING WATER POLLUTION IN THE STEEL, TEXTILE, AND PAPER INDUSTRIES IN ALABAMA

Auburn Univ., Ala. Water Resources Research Inst.

H. B. Pickle, A. C. Rucks, and R. Sisson.

Availability from NTIS as PB-227 334 \$4.75 in paper copy, \$1.45 in microfiche. Water Resources Research Institute Bulletin 14, 1973, 129 p, 14 fig, 39 tab, 35 ref. OWRR C-3292 (No 3715)(4).

Descriptors: *Alabama, *Benefits, *Industrial wastes, *Pollution abatement, *Recreation, Aquatic life, *Industrial water, Water utilization, Pulp and paper industry, *Cost comparisons.

Identifiers: Steel industry, Textile industry.

Economic values were computed for three water uses: water-oriented recreation, aquatic life propagation, and industrial water use. To evaluate economic benefits, the extent was determined to which effluents from paper, steel, and textile mills affected water quality. Water quality criteria were developed for the evaluation of actual water quality. The comparison of existing quality conditions to appropriate criteria determined the number of river miles which could not be used for a beneficial water use. The 64 stream miles determined unsuited for water-oriented recreation in Alabama could develop \$2,000,000 annually in economic benefits under adequate pollution abatement. Pollution abatement along 89.1 stream miles which are adversely affected by effluents from steel, textile, and paper mills, would increase bordering land value \$16,067 per mile per year or approximately \$1.45 million annually. Annual benefits in aquatic life propagation would be \$662,699. Annual savings from reduced preindustrial water treatment would amount to \$356,272. The total economic benefit derived by controlling water pollution from the paper, steel, and textile industries of Alabama is approximately \$4.5 million per year. (See also W74-01101; W74-02437 and W74-03752) (Norman-Alabama)

W74-03753

ILLINOIS STORM SEWER SYSTEM SIMULATION MODEL: USER'S MANUAL

Illinois Univ., Urbana. Dept. of Civil Engineering.

A. S. Sevuk, B. C. Yen, and G. E. Peterson.

Availability from NTIS as PB-227 338 \$5.50 in paper copy, \$1.45 in microfiche. University of Illinois Urbana Water Resources Center Research Report No 73, 1973, 168 p, 19 fig, 3 append. OWRR B-043-ILL(9). 14-31-0001-3078.

Descriptors: *Illinois, *Simulation analysis, *Storm drains, *Computer models, *Hydraulic design, Drainage systems, Flood routing, Hydrograph, Hydraulics, Mathematical models, Open channel flow, Unsteady flow, Urban runoff.

The Illinois Storm Sewer System Simulation Model is a mathematical model for sewer design and flow prediction utilizing the St. Venant equations to route unsteady flows through tree-type sewer networks. An overlapping segment scheme is used in the numerical solutions to account for the backwater effects and mutual influences of the sewers and junctions. The program is written in PL/I and assembler Language consisting of more than 3000 statements and can be executed on most large IBM 360 and 370 systems. User oriented information is provided. An example on sewer design is also given.

W74-03763

PROCESS CONTROL OF ACTIVATED SLUDGE TREATMENT

Kentucky Water Resources Inst., Lexington.

R. I. Kermode, and R. W. J. Brett.

Availability from NTIS as PB-227 238 \$4.00 in paper copy, \$1.45 in microfiche. Research Report No 63, 1973, 88 p, 18 fig, 40 ref, 9 tab. OWRB(1) A-040-KY. 14-31-0001-3517. 14-31-0001-3817.

Descriptors: *Activated sludge, *Simulation analysis, Environmental engineering, Mathematical models, Optimization, Quality control, *Sewage treatment, Settling basins, *Waste water treatment, Environmental control.

Identifiers: *Process control, Aerator models, Substrates.

General feed forward controllers, conforming to standard control modes, have been derived for an activated sludge process. The analysis indicated that the appropriate controllers are proportional control with measurement of substrate flow rate, and derivative control with measurement of inlet substrate concentration, and manipulation of the

rate of return sludge by both controllers. The performance of these controllers was tested by computer simulation of five dynamic aerator models with and without sludge storage, and with two settling basin models. In all cases significant reduction of the maximum exit substrate concentration was achieved. Additional improvement resulted from the use of sludge storage. As the aerator model became more linear the control results also improved. The first dynamic results were obtained using a perfect steady state settler model, the remainder assumed that the settler dynamics could be represented by a variable time delay. The addition of the settler dynamics caused the control to degrade somewhat. Finally the generality of the two controllers was proved mathematically for the five biological kinetic models for substrate utilization and bacterial growth. (Grieves-Kentucky)

W74-03764

EVALUATION OF THERMAL POLLUTION CONTROL ALTERNATIVES

National Environmental Research Center, Corvallis, Oreg.

B. A. Tichenor.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 7, p 7-1-7-22, 1973. 10 fig, 1 tab, 10 ref.

Descriptors: *Water pollution control, *Thermal pollution, *Thermal powerplants, Water temperature, Water reuse, Cooling towers, *Cooling water, Waste water treatment.

Identifiers: Cooling ponds.

The methods available to control pollution by cooling water discharges include site selection, intake and discharge design, and closed-cycle cooling. Site selection is the first and most important step in providing electric power with a minimum of environmental degradation. If adequate water for once-through cooling is available, careful evaluation and design of intake and discharge structures must precede the decision to use a once-through system. In almost all cases, closed-cycle cooling systems are viable alternatives to once-through cooling for thermal powerplants. They are definitely feasible from an engineering standpoint, but they do have environmental side effects which must be assessed and controlled. (Knapp-USGS) W74-03791

HEATED SURFACE DISCHARGES INTO FLOWING AMBIENT STREAMS AND LAKES

Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.

E. Silberman.

In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo, Chapter 10, p 10-1-10-44, 1973. 7 fig, 1 tab, 37 ref.

Descriptors: *Thermal pollution, *Cooling water, Water pollution effects, Thermal powerplants, Path of pollutants, Mixing, Model studies, Hydraulic models, Mathematical, Waste water treatment.

Cooling water can be provided for powerplants in various ways. Recycling through open or closed cooling towers or through cooling ponds is possible. However, the most economical method for large plants where natural water bodies are available has been the once-through cooling system wherein water is withdrawn from the water body, pumped through the condensers, and returned to the water body at higher temperature. For economic and other reasons, this method will probably continue to be used for many new powerplants where environmental constraints can be satisfied. Discharge from a surface canal usually results in higher surface temperatures, and hence more rapid transfer of heat from the water to the atmosphere, than does discharge from a sub-

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Group 5D—Waste Treatment Processes

merged outlet. A submerged outlet produces more rapid mixing and dilution of the warm water prior to its appearance at the surface. Thus a larger volume of water may be heated near the outlet than in the surface canal case, but to a lower temperature. Surface canals are generally more economical than submerged outlets, but limits on maximum temperature rise may restrict their use. (Knapp-USGS)
W74-03794

PILOT SCALE INVESTIGATIONS OF WELL RECHARGE USING CORED SAMPLES,

Illinois State Water Survey, Urbana.

H. F. Smith, R. J. Schicht, and H. W. Humphreys. Paper No 11 of Artificial Groundwater Recharge Conference, University of Reading, England, Sept 21-24, 1970, Vol 2: The Water Research Association, Marlow, England, p 279-296, June 1971. 6 fig, 1 tab, 9 ref.

Descriptors: *Artificial recharge, *Injection wells, *Reclaimed water, *Waste water treatment, *Water reuse, Sandstones, Water quality, Water chemistry, *Illinois.

Laboratory studies were conducted in Illinois to determine if artificial recharge of sandstone aquifers with sewage effluent is feasible. The apparatus used in this research consisted of four main components: (1) permeameter; (2) filters; (3) chlorinator; and (4) constant head tank. The Iron-ton-Galesville sandstone, since it is the most productive formation in the deep sandstone aquifer, was selected for investigation. The core samples are described by the Illinois State Geological Survey as fine to medium grained sandstone, moderately well sorted, and friable. The median grain size is 0.30 mm, with the maximum grain size about 0.75 to 1.0 mm. After discharge of deionized water through the sandstone core has stabilized, filtered and chlorinated sewage effluent was recharged. A pretreated effluent of the type used could be successfully recharged through a sandstone well having similar characteristics to the cores used. The pretreatment would consist of removal of solids, a disinfectant, and control of pH. Sand filters are the most reliable type of filter with fewer problems of maintenance. (Knapp-USGS)
W74-03823

GROUNDWATER RECHARGE FOR WASTE WATER RECLAMATION AND/OR STORAGE OF SUPPLIES: A COST COMPARISON WITH CONVENTIONAL METHODS,

Asian Inst. of Tech., Bangkok (Thailand).

R. J. Frankel. Paper No 14 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970, Vol 2: The Water Research Association, Marlow, England. p 359-383, June 1971. 2 fig, 10 tab, 27 ref.

Descriptors: *Artificial recharge, *Water reuse, *Reclaimed water, Economics, *Waste water treatment, Cities, Water resources development, Land use, Water management(Applied), *Cost comparisons.

Renovation and reuse of waste waters through artificial recharge of aquifers represents an attractive alternative to other advanced reclamation processes, to low-flow augmentation and higher treatment costs prior to stream disposal, and to surface storage of municipal water supplies. A groundwater recharge reclamation system is also amenable to development in small increments over time. Coordination of land and water resources programs would greatly enhance the development of groundwater recharge systems. When the land used for spreading grounds is in the vicinity of urban development and is considered in future urban planning, the more expensive the land used for recharge purposes, the less expensive is the

cost of water if land values are appreciating at a high enough rate. (Knapp-USGS)
W74-03825

THE FUTURE PROSPECTS OF ARTIFICIAL GROUNDWATER RECHARGE,

California Univ. Berkeley.

D. K. Todd. Paper No 15 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970, Vol 2: The Water Research Association, Marlow, England, p 385-399, June 1971. 45 ref.

Descriptors: *Artificial recharge, *Underground waste disposal, *Water reuse, Reclaimed water, Waste disposal wells, Injection wells, Water storage, *Waste water treatment.

The traditional basis for artificial recharge has been to augment groundwater storage using water obtained from controlled releases of upstream reservoirs or from importations. The method provides for storage of large volumes of water in natural reservoirs without the cost of building a surface reservoir. Moreover, in the Western United States few sites remain where it would be economically feasible to construct dams. Storing water underground has the advantages of minimizing evapotranspiration losses, equalizing water temperatures, providing natural filtration, and insuring a protected local water supply during times of emergency. More than 400 cities in the United States now use their treated effluent for agricultural irrigation or groundwater recharge. Water reclamation systems may be classified into infiltration basins, ridge-and-furrow, spray-irrigation, spray-runoff, and recharge wells. Renovation is most successful when wastewater is applied to a soil system which incorporates vegetation, such as a woodlot, pasture, or cropped land. Removal of nutrients by the vegetation produces a better quality of water than if the vegetation were absent. The major problems of water reclamation systems are maintenance of high infiltration rates and removal of odor and taste. Recharge rates can be maximized by alternate wetting and drying cycles of surface installations and by periodic redevelopment of recharge wells. The injection of liquid wastes into deep underground formations by means of wells is in reality a storage method rather than a disposal method because the wastes injected into the stratum remain there indefinitely. It is often not recognized that most potential injection zones are filled naturally with brine or another unusable fluid, hence the pore space only becomes available by displacement or extraction of the natural fluid, which merely relocates the disposal problem. (Knapp-USGS)
W74-03826

OCCUPATIONALLY RELATED HEALTH HAZARDS IN WASTEWATER TREATMENT SYSTEMS,

Ottawa Univ. (Ontario).

For primary bibliographic entry see Field 5C.
W74-03833

MIXED CULTURE BIOOXIDATION OF PHENOL. III. EXISTENCE OF MULTIPLE STEADY STATES IN CONTINUOUS CULTURE WITH WALL GROWTH,

State Univ. of New York, Buffalo. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 5C.
W74-03881

THE EFFECTIVENESS OF SAND FILTERS FOR THE REMOVAL OF COLLOIDAL MANGANESE OXIDES FROM WATER USING SELECTED CATIONS AS FILTER AIDS,

Wyoming Univ., Laramie. Water Resources Research Inst.

For primary bibliographic entry see Field 5F.

W74-03893

DISTRIBUTIONAL IMPACTS OF ENVIRONMENTAL QUALITY MANAGEMENT: THE CASE OF FEDERAL GRANTS FOR WATER POLLUTION CONTROL,

New York State Coll. of Agricultural and Life Sciences, Ithaca.

L. E. Gosse, and R. J. Kalter.

Available from the National Technical Information Service as PB-227 473; \$3.75 in paper copy, \$1.45 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, Technical Report 41, June 1972. 48 p, 1 fig, 16 tab, 3 append. OWRR C-2199(3409)(4).

Descriptors: Distribution, *Environmental control, Management, *Grants, *Water pollution control, Waste water treatment, *Income distribution, *Federal government, Treatment facilities, *Economic impact, Progressive taxes, Human population, United States.

Income redistribution effects of waste water treatment grants were estimated for each state in a federal program. The impact of progressive income taxes and grant formulae, which were intended to favor states with low income per capita, were shown to have little net redistribution effects in fact. High per capita income states still were treated favorably in most cases because they also had high population bases.
W74-03894

PHYSICAL-CHEMICAL WASTEWATER TREATMENT PLANT DESIGN,

CH2M/Hill, Corvallis, Ore.

G. Culp, L. G. Suhr, D. R. Evans, and R. L. Woodward.

Environmental Protection Agency, Technology Transfer Seminar Publication, August 1973. 41 p, 6 fig, 12 tab, 13 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Design criteria, Coagulation, Filtration, Activated carbon, Lime, Sludge disposal, Specifications, Estimated costs, Sludge, Cost comparisons.

Identifiers: *Physical-chemical treatment, Sludge recovery.

Typical design parameters for the unit processes involved in physical-chemical treatment of raw wastes and how the design engineer may determine the design criteria best suited for a given wastewater are described. Preliminary data necessary includes determination of the best coagulant, the amount of sludge produced, how well the sludge dewaterers, practicability of coagulant recovery, the particulate, colloidal, soluble, and nonadsorbable fraction of organics in the raw wastewater, the fraction of soluble organic phosphorus and nitrogen in the raw wastewater, carbon contact time required, and the effluent quality that can be expected. Niagara Falls, N.Y., and Fitchburg, Mass., are sites used in design project descriptions. At Niagara Falls a physical-chemical process was selected largely because of the objectionable constituents would not have been removed by biological processes. At Fitchburg the process was chosen because of the better quality effluent produced, and the greater stability in operation, as compared with biological treatment. The choice was clear in each case. (Slattery-Wisconsin)
W74-03957

RECYCLED WATER,

E. R. Hartley.

Science Digest, Vol 70, p82-86, November 1971. 2 photo.

Descriptors: *Florida, *Sewage treatment, *Filtration, Sewage effluents, Nuclear energy, Activated carbon, Aeration, Carbon filters, Soil fil-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

ters, Tertiary treatment, Water pollution, Water pollution treatment, Water quality, *Recycling, Waste water treatment.

Development of practical, nuclear-powered purification systems for recycling sewage has been accomplished with an irradiation unit in operation in Palmdale, Florida. The irradiation unit contains a core of pencils filled with Cobalt-60, which breaks down the components of sewage, producing an odorless effluent. At the Palmdale facility, waste water moves into a wet well where large pieces of organic matter are screened out or broken up. The effluent then moves into an aeration tank where air is introduced, mixing the waste water and breaking down some of the materials. The water is then circulated through the core of the irradiation unit for ninety minutes, and when it emerges it is perfect for agricultural use. After being deposited in a holding tank, the effluent is filtered through a diatomaceous earth filter and finally through an activated carbon filter, producing water good enough to drink. There is no volume limitation on the system and it can be added to existing secondary treatment facilities. Experts predict nuclear sewage disposal to be eventually no more expensive than presently used thorough tertiary treatment. (Ritchie-Florida)

W74-03976

INDUSTRIAL WATER POLLUTION CONTROL—AN OVERVIEW,
Rex Chainbelt, Inc., Milwaukee, Wis.
W. C. Messinger.
Vital Speeches, Vol 38, p 632-635, 1972.

Descriptors: *Water pollution, Control, *Industrial wastes, *Chemical wastes, Sewage, Regulation, Environmental effects, Biochemical oxygen demand, Economic impact, Pollution abatement, Control, Streams, Waterways, Federal government, Municipal wastes, *Waste water treatment.

The Rex Company makes pollution control and abatement machinery and systems. The ecology division of the company conducts scientific study programs, engineering evaluation, laboratory sampling analyses, and other activities. The principal work done by Rex in industrial pollution control is chemical waste treatment. The industrial water pollution problem is dramatized by the fact that industry in the U.S. discharges nearly three times as much biochemical oxygen demand (BOD) as all municipalities. Industries are now beginning to do much more in the control of pollution by expending much more money and effort. The costs to clean up the streams and waterways are tremendous and must be borne by government, industry, and the consumer. Also because of more stringent regulations established by the Environmental Protection Agency, it sometimes becomes necessary to shut down some polluters that cannot comply. With a joint effort of government and industry much progress can and is being made. (Daniels-Florida)

W74-04028

WATER RENOVATION FOR UNRESTRICTED RE-USE,
Corps of Engineers, Washington, D.C.
T. D. Hinesly.
Water Spectrum, Vol 5, No 2, p 1-8, 1973. 3 illus, 1 chart.

Descriptors: *Waste water treatment, *Water balance, *Irrigation, *Water conservation, *Water reuse, Soil conservation, Industrial wastes, Municipal wastes, Soil-water-plant relationships, Trafficability, Soil infiltration, Soil erosion, Nutrients, Waste treatment, Soil management, Drainage effects, Land development.

Identifiers: Spray irrigation treatment.

Spray irrigation land treatment has the greatest applicability to different soil types and cultural practices of all methods of wastewater treatment. As wastewater quantities increase in a particular region, spray irrigation systems are easily expanded to cover greater areas. Maximum benefits are realized from the plant and animal nutrients recycled in growing plants, which is the most important reason for choosing irrigation over other land treatment systems when possible. Many of these nutrient elements are becoming increasingly scarce and more costly to replace in soils. The most important aspect of spray irrigation land treatment is selecting a site where the frequencies and rates of water applications will be limited by the soil's capacity to filter, absorb and precipitate pollutants, rather than by soil hydraulic characteristics. The primary or short term limitation on wastewater applications should be the ability to manage cropping systems for nitrogen removal. Successful operation is dependent upon the types of vegetation and cultural practices employed. Many are concerned that maximizing water applications will lead to increased soil erosion on sloping lands. But the same crop and soil management practices effective in controlling soil erosion will apply during wastewater renovation. Flooding or health hazards also will not be a problem. (Silber-Florida)

W74-04034

BATCH DISINFECTION OF TREATED WASTEWATER WITH CHLORINE AT LESS THAN 1 DEG C.

Environmental Protection Agency, College, Alaska, Arctic Environmental Research Lab.
R. C. Gordon, and C. V. Davenport.
Copy available from GPO Sup Doc as EPI.23:660/2-73-005, \$0.65; microfiche from NTIS as PB-228 092 \$1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-005, September 1973. 31 p, 6 tab, 29 ref. EPA Project 16100 GK6.

Descriptors: *Disinfection, *Waste water treatment, *Bioindicators, *Coliforms, *Chlorine, *Winter, Alaska, Bacteria, Chlorination.

Identifiers: Total coliforms, Fecal coliforms, Batch disinfection, Low temperature.

A laboratory study was conducted, using batch treatment technique, to gain some insight into chlorine disinfection of waste treatment system effluents at less than 1 deg C. One primary and three secondary effluents were examined at the low temperature with parallel control samples at 25 deg C. Effluent disinfection was considered minimally effective if, after one hour contact time in the presence of 1 mg/l total chlorine residual, there were no more than 1000 total and 200 fecal coliforms/100 ml. The results indicated that both chlorine demand and the rate or extent of coliform reduction were decreased at the low temperature. The disinfecting ability of chlorine varied significantly at less than 1 deg C, among the four effluents studied. These effects did not in themselves negate the effectiveness of chlorine as a disinfectant at low temperature because the previously stated minimums were easily met in effluent from all sources. However, higher bacterial quality can be expected from batch treatment than is found in most short-circuit plagued operating contact chambers. The only real measure of satisfactory disinfection is the number of enteric bacteria being discharged into the receiving water. An arbitrary chlorine residual after a predetermined contact time cannot be considered prima facie evidence of satisfactory disinfection because of the variable disinfecting ability of chlorine. The chlorine residual:contact time relationship must be established for each effluent at the lowest temperature encountered in the system. (EPA)

W74-04042

TREATMENT OF HAZARDOUS MATERIAL SPILLS WITH FLOATING MASS TRANSFER MEDIA,

Battelle-Pacific Northwest Labs., Richland, Wash.
B. W. Mercer, A. J. Shuckrow, and G. W. Dawson.
Copy available from GPO Sup Doc as EPI.23:670/2-73-078, \$1.25; microfiche from NTIS as PB-228 050 \$1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-078, September 1973. 93 p, 32 fig, 9 tab, 10 ref. EPA Project 15090 HGQ. Contract 68-01-0124.

Descriptors: *Activated carbon, *Ion exchange, *Resins, Water pollution treatment, Water pollution control, Mass transfer, *Waste water treatment.

Identifiers: *Hazardous materials spills, *Hazardous chemicals.

An approach for the in situ treatment of spills of soluble hazardous polluting substances was developed and demonstrated on a field scale for a static body of water. Laboratory scale experimentation showed that floating sorbents and ion exchange resins could be highly effective removal agents when applied as small particles beneath the surface of contaminated waters. A lightweight commercial activated carbon was found to be particularly effective for removing organic substances such as phenol, aromatic hydrocarbons, and organophosphorus insecticides from water. Floating ion exchange resins were also prepared for use on spills of acid, alkalis, and toxic salts. Hollow glass microspheres are incorporated in the resin granules for buoyancy. Field demonstrations were conducted using carbon contained in weighted plastic gallon bottles. The carbon proved highly effective in removing an organophosphorus pesticide spilled in a large basin, and was easily collected through use of an oil containment boom. Ice encapsulated floating anion exchange resin beads were similarly employed to neutralize a spill of sulfuric acid. (EPA)

W74-04043

FABRIC BOOM CONCEPT FOR CONTAINMENT AND COLLECTION OF FLOATING OIL,

CONSULTEC, Rockville, Md.

For primary bibliographic entry see Field 5G.

W74-04044

SELECTIVE NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,

Process Research, Inc., Cambridge, Mass.

J. L. Eisenmann, and J. D. Smith.
Copy available from GPO Sup Doc as EPI.23:670/2-73-076, \$1.75; microfiche from NTIS as PB-228 108 \$1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-076, September 1973. 155 p, 61 fig, 31 tab, 9 ref. EPA Project 17010 FBJ. 14-17-179.

Descriptors: *Separation techniques, *Membrane processes, *Sewage effluents, *Waste water treatment, *Nitrates, *Phosphates, *Ammonia, Permeable membranes, Dialysis, Diffusion, Membranes, Permeability, Water pollution sources, *Nutrient removal, Sewage treatment, Ion exchange.

Identifiers: Donnan dialysis, *Exchange diffusion, Secondary effluents, Selective separation.

Exchange diffusion (Donnan dialysis) with ion-exchange membranes was investigated as a potential process for the removal of nitrate, phosphate and ammonia from secondary sewage plant effluents. Using commercial ion-exchange membranes and plate-and-frame configuration ninety percent removals were obtained in laboratory and pilot scale experiments. Ammonium removal appears to be economically feasible while a combined nitrate-phosphate system is only marginally economic at the present state of development. Improvements in cell configuration and membranes

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are suggested as a means of improving the process costs. (EPA)
W74-04045

U-TUBE AERATION,
Rockwell International Corp., Canoga Park, Calif.
Rocketyne Div.
R. C. Mitchell.

Copy available from GPO Sup Doc as EP1.23:670/2-73-031, \$2.00; microfiche from NTIS as PB-228 127 \$1.45. Environmental Protection Agency, Technology Series Report EPA 670/2-73-031, September 1973. 186 p, 62 fig, 11 tab, 34 ref. EPA Project 17050 DVT. 68-01-0120.

Descriptors: *Aeration, *Sulfide control, *Odor control, *Corrosion control, *Aerobic conditions, Water pollution control, Sewers, Effluent streams, Natural streams, Oxygenation, Design, Performance, *Waste water treatment, *Sewage treatment.
Identifiers: *Aerators(U-tube).

The results of two experimental and analytical projects to develop and evaluate the U-tube aeration concept are presented. Experimental data were obtained to characterize the mass transfer and fluid dynamics behavior of U-tube systems over large ranges of design variables and operating conditions. Tests were made first with a pilot-scale (2-inch diameter) U-tube. Subsequently, full-scale (8 to 20-inch diameter) prototype systems were successfully designed, constructed (under EPA grant projects), and operated in sanitary sewer systems in Jefferson Parish, Louisiana, and Port Arthur, Texas. These field installations have been effective in reducing previous serious odor and corrosion problems resulting from sulfides. No maintenance has been required for aspirated-air systems in approximately 2 years of continuous operation. Mass transfer and fluid dynamics correlations, plus a design computer program, were developed for use in designing U-tube systems. A satisfactory basis for design now exists, although additional improvements are needed. U-tube systems are a practical, flexible, efficient method for aeration for a number of applications. They are well-suited to applications in which it is desired to raise the oxygen concentration of a moving stream, even to saturation. (EPA)
W74-04046

WATER RECOVERY AND SOLID WASTE PROCESSING FOR AEROSPACE AND DOMESTIC APPLICATIONS.

Martin Marietta Corp., Denver, Colo.
Available from NTIS, Springfield, Va. 22151 N-73-19161 Price \$4.25 printed copy, \$1.45 microfiche. Final Report, Executive Summary, National Aeronautics and Space Administration, Manned Spacecraft Center Report MCR-73-7, January 1973. 33 p, 2 fig, 3 tab. NASA NAS9-12504.

Descriptors: *Waste water treatment, *Recycling, *Water supply, *Control systems, Methodology, Potable water, Aircraft, Rural areas, Design criteria, Domestic water, *Water reuse.
Identifiers: Domestic water systems, *Spacecraft water systems.

The formulation of the preliminary design of a water management system is described. The system is suitable for closed loop recycling of wastewater to potable water for a group of (500) dwelling units. Also included is a summary of the design, development, manufacture, and demonstration of a system which will provide data applicable to both aerospace and domestic systems. Tasks conducted during this program included: studies of domestic water use profiles and available domestic plumbing hardware; establishment of a baseline concept; review of aerospace technology concepts and hardware for domestic application, establishing candidate unit treatment

processes; formulation of the preliminary design; development of a computer program for system performance determination, and a conceptual test program. (Woodard-USGS)
W74-04053

DIGITAL COMPUTER PROGRAMS FOR THE COST ENGINEER.

National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.

Available from the National Technical Information Service as PB-213 974, \$5.00 in paper copy, \$1.45 in microfiche. March 1971. 29 p.

Descriptors: *Computer programs, *Costs, *Waste water treatment, *Utilities, Performance, Waste water disposal, Water demand, Design, Estimating, Engineering, Sewerage, Operation and maintenance, Regional analysis, Air pollution.
Identifiers: Payroll computer program.

Specific digital computer programs employing various analytical techniques are described, their availability and computing systems indicated, and sources of information concerning them identified in order to catalogue existing opportunities for high-speed solution of cost engineering problems. The programs are applicable to performance of the activated sludge process, cost estimating for wastewater treatment plants, and evaluation of water supply and wastewater disposal (including seawater distillation and wastewater renovation). Also, models are included for design of wastewater treatment systems, complete secondary treatment systems, electrodialysis process, lime recalcination, reverse osmosis, sludge fluidized bed incineration, tertiary treatment by lime addition, ammonia stripping, waste stabilization pond, microscreen process, trickling filter, and ion exchange, other programs are applicable to job cost accounting for payroll and expenses, estimates for engineering and construction projects, payroll system for contractors, design of a sanitary sewer system, accounting of computer time cards, flow data at outlying sewage pumping stations, control and direct maintenance in waste treatment, record keeping, chemical processing plant cost estimating, complete domestic waste treatment system design, equipment analysis of a sewage plant system, and regional air pollution analysis. Solution techniques include simulation analysis, integer linear programming, cost accounting schemes, and the critical path method. (Weaver-Wisconsin)
W74-04087

INTENSIVE OUTDOOR CULTURE OF MARINE PHYTOPLANKTON ENRICHED WITH TREATED SEWAGE EFFLUENT.

Woods Hole Oceanographic Institution, Mass.
W. M. Dunstan, and K. R. Tenore.

Aquaculture, Vol 1, No 2, p 181-192, 1972. 4 fig, 5 tab, 18 ref.

Descriptors: *Aquaculture, *Harvesting of algae, *Marine algae, *Sewage treatment, Nutrients, Mollusks, Oysters, Mussels, Shellfish, Carbon, Phosphates, Nitrogen, Phosphorus, Silica, Diatoms.

Identifiers: *Outdoor culture, Cylindrotheca closterium, Prasinocladus subsalsa, Chaetoceros simplex.

Research results are described in which mixed, natural populations of marine phytoplankton, enriched with secondary sewage effluent, were grown and harvested daily from 400-liter outdoor tanks. The single daily dilution culture method provided good yields. The harvested cells were subsequently used on a daily basis to feed bivalve molluscs. Chlorinated, secondary sewage effluent was collected directly from the treatment plant. Algal cultures initiated by pumping sea water from one meter below the surface. After enrichment

with sewage or artificial medium, the natural mixed population of algae was allowed to grow for 4-7 days until it reached maximum density. Using a daily harvest rate of 50%, yield in algae ranged from one to five grams carbon/sq m/day, averaging 2.6 over the four-month period. Under outdoor conditions, sewage enrichment of sea water in the tanks stimulated growth of various microalgae usually dominant in the water before enrichment. Several sources and samples of sewage effluent were successfully used for enrichment. Possible control of species composition was demonstrated using different nutrient combinations. The objectives of the combined tertiary sewage treatment-aquaculture system is simultaneously to produce algae while removing the inorganic nutrients from the sewage effluent. (Jones-Wisconsin)
W74-04103

CHEMICAL CHANGES IN THE WATER AND ACCUMULATION STRATUM OF SOILS IN PONDS FERTILIZED WITH BEET-SUGAR FACTORY WASTES.

For primary bibliographic entry see Field 5C.

W74-04110

COST ANALYSIS OF OPTIONAL METHODS OF SHIPBOARD DOMESTIC WASTE DISPOSAL.

C. H. Piessall, Jr., and R. E. Borgstrom.
Naval Engineers Journal, Vol 85, No 1, p 86-92, February 1973. 5 tab, 5 ref.

Descriptors: *Cost analysis, *Domestic wastes, Ships, *Waste water treatment, Water quality control, Annual, Investment, Oceans, Operating costs, Mathematical models, Equations, Systems analysis, Estimating, *Waste disposal.

Identifiers: Sea-going surface ships, Surface fleet, Total cost, Sensitivity analysis, *Shipboard waste disposal.

The problem of costs of sewage and waste disposal from U.S. Navy ships is considered. Presented is a cost analysis of four major options for disposal of shipboard domestic waste, with modifications to two of the options. The annualized investment and operating costs associated with the implementation of each of the options are given. The model used considers non-nuclear, sea-going surface ships with a manning level greater than 50 men. The approach of developing estimates on a per ship per class basis and aggregating them for the total surface fleet permits the investigation of different combinations of the options merely by specifying the number and type of ships to be considered in any option. Results of a sensitivity analysis of total costs per option to changes in investment and operating costs, and to variation in fleet size, are given. (Bell-Cornell)
W74-04115

DESIGN AND COST ALLOCATION ALGORITHM FOR WASTE TREATMENT SYSTEMS.

Thayer School of Engineering, Hanover, N.H.
D. L. McConaghay, and A. O. Converse.
Journal Water Pollution Control Federation, Vol 45, No 12, p 2558-2566, December 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Waste water treatment, *Regions, Costs, *Design, Optimization, Construction costs, Pipes, Rivers, Treatment facilities, Mathematical models, Systems analysis, Regional analysis.

Identifiers: *Regional planning, *Cost minimization, *Heuristic algorithm, Trunk sewers, Location, Decomposition techniques.

Economics of scale result in significant savings when waste from several communities is treated in a single regional facility. However, a trade-off exists between the savings in treatment costs and the cost of transporting the waste from communities

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Ultimate Disposal Of Wastes—Group 5E

to the regional plant. Presented is a heuristic algorithm for the regional planning of wastewater treatment systems. The objective is to determine the optimal combination of waste treatment plants and interconnecting trunk sewers so that all wastes generated within the region can be treated at minimum cost. The system consists of a number of distinct sources of waste (communities or towns) located in a designated region. Average daily flow of wastewater generated at each source, the elevation of each source, and the length of possible trunk sewer connections between sources are specified. The heuristic algorithm yields, in most cases, the optimal collection-treatment system for a set of sources located in an arbitrary arrangement: it allows branched collection systems. Convergence is always obtained, but the answer is dependent upon the starting conditions. In the systems studied to date, however, the algorithm has always yielded the minimum cost solution when the assumed starting configuration is treatment at each source with no collection. (Bell-Cornell)
W74-04116

COMPUTER-ASSISTED ACTIVATED SLUDGE PLANT OPERATION,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
P. G. Lacroix, and D. E. Bloodgood.
Effluent and Water Treatment Journal, Vol 13, No 11, p 701-714, November 1973. 3 fig, 2 tab, 26 ref.

Descriptors: *Activated sludge, *Treatment facilities, *Operation and maintenance, *Simulation analysis, *Computer programs, *Mathematical models, Water quality control, Waste water(Pollution), Waste water treatment, Control, Design, Systems analysis, *Indiana.
Identifiers: *Fort Wayne(Ind).

Activated sludge plants are difficult to operate; problems arise from the varying nature of the purifying wastewater characteristics and the difficulty of maintaining a readily settleable sludge. Presented is a computer program based on mathematical models that are formulated from full-sized plant operation data, that simulate an activated sludge system, and that can assist plant operators in controlling and optimizing treatment plant performance. A computer-assisted plant operation study describes the possible use of computers for operating the Fort Wayne, Indiana wastewater treatment facilities, which have been represented elsewhere by five mathematical models. The models are presented, and they predict at specified stations the mixed liquor suspended solids in the aeration tank effluent, return sludge suspended solids from the sedimentation tank, and suspended solids and BOD in the final plant effluent. The computer program (Conventional Activated Sludge System Operation), written in FORTRAN IV, is a computational scheme that solves simultaneously the solids balance and the mathematical equations that describe the activated sludge system. The computation is strictly for steady-state conditions, and the program is arranged to simulate many design and operating conditions. The computer program, CASSO, can simplify the operation of an activated sludge plant; CASSO can be used as a tool for any one day of activated sludge operation. (Bell-Cornell)
W74-04119

MANAGEMENT OF RADIOACTIVE AQUEOUS WASTES FROM AEC FUEL-REPROCESSING OPERATIONS,
Division of Production and Materials Management (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-04188

WASTE WATER IMPURITY LEVEL AFFECTS FLOCCULATION EFFICIENCY OF POLYELECTROLYTES,
Swedish Inst. for Surface Chemistry, Stockholm.
S. Friberg, K. Roberts, and A.-M. Wennerberg.
Ambio, Vol 1, No 5, p 180-181. 1972. Illus.
Identifiers: Aluminum sulfate, Bacteria,
*Electrolytes, *Flocculation, Polyelectrolytes,
Sedimentation, *Waste water treatment,
*Chemical precipitation, Settling rates.

The rates of chemical sedimentation of domestic waste water and bacteria with aluminum sulfate and polyelectrolytes vary with changing concentrations of certain dissolved organic impurities (protein, lipid and saccharide) present in the system. Proteins increase, while saccharides and lipids decrease the sedimentation rate. This may explain the periodic variation in efficiency of chemical sedimentation often observed in domestic waste water plants.—Copyright 1973, Biological Abstracts, Inc.
W74-04195

EXPLICIT CALIBRATION OF THE PILLS II SYSTEM,

Environmental Systems Corp., Knoxville, Tenn.
F. M. Shofner.

Copy available from GPO Sup Doc as EPI.23:660/2-73-011, \$0.65; microfiche from NTIS as PB-228 094, \$1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-011, September 1973. 28 p, 7 fig, 4 ref. EPA Project 16130 GNK.

Descriptors: *Cooling towers, *Measurement, *Calibrations, Instrumentation, Generators, Distribution, Treatment facilities.

Identifiers: *Drift measurement, *Electro-optic instruments.

The basic characteristics of the PILLS I and II Systems are reviewed and up-dated from previous publications. Emphasis is given to the explicit calibration of PILLS II with water droplets. The operational characteristics and accuracy of the monodisperse particle generator are discussed. General procedures for deriving the particle density distribution from the measured voltage density distribution are described. (See also W72-10818) (EPA)
W74-04198

THE DIRECT-CYCLE NUCLEAR GAS TURBINE WITH ECONOMICAL DRY AIR COOLING,

Gulf General Atomic Co., San Diego, Calif.
J. M. Krase, D. C. Morse, and T. W. Schoene.
Proceedings of the American Power Conference, Vol 34, p 512-520, 1972. 4 fig, 3 ref.

Descriptors: *Electric power production, *Cooling, *Thermal pollution, *Nuclear reactors, Thermal power plants, Research and development, Design, Design criteria, Nuclear energy, Structural engineering, Environmental control, Heat transfer, Air temperature, Economics, Turbines.
Identifiers: *Dry air cooling, Dry cooling towers.

The High-Temperature Gas-Cooled Reactor (HTGR) is a possible answer to the problem of thermal pollution in the aquatic environment. It is the most efficient of available nuclear power plants and therefore has the least thermal discharge. Also, it has a near zero radioactivity release and it eliminates combustion products in the atmosphere. The use of air cooling increases possible plant sites, has no make-up water requirement and avoids the problems associated with evaporating cooling. The reactor and other key elements of HTGR gas turbine plant design are discussed briefly, and alternative designs are considered. The licensing and construction activities on the first HTGR gas turbine plant are expected

to require 5 1/2 years, followed by 2 years for start up and extensive initial testing. The advantages of the direct cycle include the heat rejection potential, lower plant costs, and possible safety and operational advantages. The potential of increased future efficiency of these types of plants is great. The high temperature of the rejected heat may be useful in a number of processes. (Jerome-Vanderbilt)
W74-04230

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
For primary bibliographic entry see Field 5B.
W74-04234

5E. Ultimate Disposal Of Wastes

THE FUTURE PROSPECTS OF ARTIFICIAL GROUNDWATER RECHARGE,
California Univ., Berkeley.
For primary bibliographic entry see Field 5D.
W74-03826

THE EFFECT OF FLUX AND GRAVITATIONAL FORCES ON MISCELLANEOUS DISPLACEMENT IN A THIN HOMOGENEOUS BED,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 2F.
W74-03896

COST ANALYSIS OF OPTIONAL METHODS OF SHIPBOARD DOMESTIC WASTE DISPOSAL,
For primary bibliographic entry see Field 5D.
W74-04115

TRANSIENT PRESSURE TESTING OF FRAC-TURED WATER INJECTION WELLS,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 8G.
W74-04147

DISPOSAL OF RADIOACTIVE WASTES INTO THE UNDERGROUND IN THE FEDERAL REPUBLIC OF GERMANY - A SURVEY ON PRACTICAL EXPERIENCE AND R AND D WORK,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
W. Hild.
Report No. KFK-1820, April 1973. 26 p, 7 fig, 1 tab, 10 ref.

Descriptors: *Nuclear powerplants, *Radioactivity, *Effluents, *Radioactive waste disposal, *Mining, *Saline deposits, Water pollution, Biological properties, Biological treatment, Natural resource, Oil, Withdrawal, Tritium, Geologic formations.
Identifiers: *Germany.

In the Federal Republic of Germany solid and solidified wastes are disposed of in the salt mine Asse. A short review is given of the extensive R and D programs under way; practical experience gained during routine disposal operations is described. Deep-well injection of tritium-containing effluents into isolated depleted oil horizons of the deep underground is being studied as an approach to tritium disposal which does not lead to pollution of the biosphere. (Houser-ORNL)
W74-04171

WAT'S NEW IN DEEP-WELL INJECTION,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.
H. Bouwer.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5E—Ultimate Disposal Of Wastes

Civil Engineering, Vol 44, No 1, p 58-61, January 1974. 3 fig.

Descriptors: *Waste disposal wells, *Injection wells, *Conferences, Reviews, Industrial wastes, Radioactive wastes, *Waste water disposal, Regulations, Water pollution control.

The Symposium on Underground Waste Management and Artificial Recharge was held in New Orleans in September. The Symposium was devoted to the use of the earth's crust for the disposal or treatment of liquid wastes, a field rapidly gaining interest, spurred on by "no discharge" legislation. Care should be taken that freshwater aquifers are not contaminated and the environment is not adversely affected. Earthquakes and seismic activity may also result. Most of the 280 injection wells in the United States are used for injecting surplus water, storm runoff, or sewage effluent (sometimes with water recovery in dry periods). Four percent of the wells installed were outright failures. Sixty percent are still operating. Cost of well injection may be \$2 to \$50 dollars per cubic meter. Most wells are several hundred to several thousand m deep. The injection rates are usually below 3 liter per sec and the injection pressure may be around 20 atm at the well head. Deep-well injection is governed by state regulations, and will be subject to federal policy in the future. (Knapp-USGS)
W74-04265

5F. Water Treatment and Quality Alteration

THE EFFECTIVENESS OF SAND FILTERS FOR THE REMOVAL OF COLLOIDAL MANGANESE OXIDES FROM WATER USING SELECTED CATIONS AS FILTER AIDS,
Wyoming Univ., Laramie. Water Resources Research Inst.

S. R. Jenkins.

Available from the National Technical Information Service as PB-227 234; \$3.25 in paper copy, \$1.45 in microfiche. Water Resources Series No 41, January 31, 1974, 29 p, 11 fig, 2 tab, 7 ref. OWRR B-011-WYO(1).

Descriptors: *Wyoming, *Water treatment, Filters, *Filtration, *Coagulation, Cations, Colloids, Costs, Oxides.
Identifiers: *Sand filter, *Manganese oxides.

A mathematical-chemical relationship derived to predict the most effective concentrations of Ca²⁺ for coagulation of manganese oxide particles and deposition on a rotating disc type silica surface was shown to predict the effective concentration of Ca²⁺ for removal of manganese oxide by model rapid sand filters. The concentration of calcium necessary to cause effective removal of manganese oxide was shown to be stoichiometric with the oxide concentration. The relationship derived was acceptable in predicting the removal efficiency of both 1-inch ID - 4-inch deep and 4-inch ID - 3-foot deep sand filters. Differences in pH had little effect on the maximum effectiveness concentration of Ca²⁺. However, precoating of the sand with Ca²⁺, and rate of filtration were shown to greatly effect the concentration of Ca²⁺ for effective manganese oxide removal. The cost of treating naturally occurring waters of Wyoming was shown to be small if rapid sand filtration plants were available. For example, most Wyoming waters contained enough Ca²⁺ that further additions of this cation would not have to be made. Consequently, the only cost would be the cost of oxidizing the manganese. If MnO₄ was used as an oxidant the cost was shown to be about 0.19 cents/cap/day. In rare cases where lime would have to be added to increase the Ca²⁺ concentration, the cost would rise to only 0.34 cents/cap/day. Unfortunately, most Wyoming communities do not have existing sand filtration plants making the removal of manganese by this

method uneconomical. The benefit gained by removing the manganese is usually not worth building a filter plant solely for that purpose.
W74-03893

THE ABILITY OF SOME MINERALS TO ABSORB VIRUSES FROM WATER (IN UKRAINE)

L. I. Hloba, L. M. Lastovet's, and M. M. Rotmistrov.
Mikrobiol Zh (Kiev). Vol 34, No 1, p64-65. 1972.
Identifiers: Adsorption, Ammonium cells, Disinfection, Human virus, Microorganisms, *Minerals, *Viruses (Coxsackie B-3), *Water treatment.

Palygorskite (attapulgite), bentonite, agloporite, vermiculite and silica gel were most effective in adsorbing the Coxsackie B3 virus from water. A study of viral biological activity on human ammonium cells indicated the kaolin and palygorskite, treated with Al³⁺ or dimethylalkylammonium chloride decreased cell survival. The effective mineral may be used in disinfecting water containing pathogenic microorganisms and viruses.—Copyright 1973, Biological Abstracts, Inc.
W74-03978

WATER SAMPLING AND LABORATORY SERVICE,

Bridgeport Hydraulic Co., Conn.
For primary bibliographic entry see Field 5A.
W74-04024

SAFE DRINKING WATER ACT OF 1972-S.3994.

For primary bibliographic entry see Field 5G.
W74-04030

SELECTIVE NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,

Process Research, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W74-04045

THE APPLICATION OF FUNDAMENTAL LIMNOLOGICAL RESEARCH IN WATER SUPPLY SYSTEM DESIGN AND MANAGEMENT,

Metropolitan Water Board, West Molesey (England). Queen Elizabeth II Reservoir.
For primary bibliographic entry see Field 5C.
W74-04111

THE 'TENACIOUS' IRON BACTERIA,

Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 5B.
W74-04143

CORROSION AND ITS PREVENTION IN WATERS,

National Chemical Lab., Teddington (England).
For primary bibliographic entry see Field 8G.
W74-04151

5G. Water Quality Control

THE IMPACT OF WATER POLLUTION ABATEMENT ON COMPETITION AND PRICING IN THE ALABAMA PAPER INDUSTRY,

Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W74-03752

THE ECONOMIC BENEFITS OF ABATING WATER POLLUTION IN THE STEEL, TEX-

TILE, AND PAPER INDUSTRIES IN ALABAMA,

Auburn Univ., Ala. Water Resources Research Inst.

For primary bibliographic entry see Field 5D.
W74-03753

ALASKA WATER RESOURCES RESEARCH NEEDS FOR THE 70'S.

Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W74-03757

THE EFFECTS OF ARTIFICIAL SUNLIGHT UPON FLOATING OILS.

Chelsea Coll. of Science and Technology, London (England). Dept. of Pharmacy.
For primary bibliographic entry see Field 5B.
W74-03777

EVALUATION OF THERMAL POLLUTION CONTROL ALTERNATIVES,

National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W74-03791

CHEMICAL AND BIOLOGICAL SURVEY OF THE SAVANNAH RIVER ADJACENT TO ELBA ISLAND,

Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W74-03804

WATER RESOURCES MONITORING AND EVALUATION—A KEY TO ENVIRONMENTAL PROTECTION IN ALABAMA OIL FIELDS,

Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 5B.
W74-03807

AN INDUSTRIAL POLLUTION INDEX,

Winthrop Coll., Rock Hill, S.C. Dept. of Economics.
J. H. Padgett, and R. A. Stanford.
Water Resources Bulletin, Vol 9, No 2, p 320-327, 1973. 2 tab, 1 append.

Descriptors: *Social impact, Planning, Optimal development plans, *Industrial wastes, Industrial production, Air pollution, Water pollution, Water quality standards, *Alternative planning.
Identifiers: *Industrial pollution index, Social cost.

Industrial waste comes concomitant with industrial development. Little is known about how to incorporate costs associated with these wastes into development decisions. An industrial pollution index is suggested as a method to illustrate to developers the social costs arising from alternative manufacturing processes and sectors. The index incorporates a number of measures of pollution arising from each process, summarizing them into a single number. It is constructed by: (a) normalizing each measure; (b) weighting the normalized data for each measure and (c) summing the resultant weighted normalized data for a single industry. A program designed to calculate composite index numbers from available input data of twenty or less variables and 150 or less observations per variable is given. The index is illustrated using 1963 Standard Industrial Classification (SIC) two-digit industries, recognizing two forms of pollution, air and water, and weighing each equally. Expenditures on fuel and water discharged are used as proxy variables to indicate probable environmental pollution. The result gives the petroleum and coal, primary metals and paper and allied products industries the worse ranking; machinery and furniture and fixtures industries the best. (Schroeder-Wisconsin)

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

W74-03889

NATIONAL WATER COMMISSION REPORTS.
For primary bibliographic entry see Field 6B.
W74-03890

LET'S ENFORCE THE RULES,
For primary bibliographic entry see Field 6E.
W74-03891

DISTRIBUTIONAL IMPACTS OF ENVIRONMENTAL QUALITY MANAGEMENT: THE CASE OF FEDERAL GRANTS FOR WATER POLLUTION CONTROL,
New York State Coll. of Agricultural and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5D.
W74-03894

SOCIAL ACCOUNTING APPROACHES TO WATER RESOURCE USE IN ECONOMIC DEVELOPMENT.
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W74-03907

CONCEPTS OF EXTERNALITIES AND SOCIAL COSTS,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W74-03908

OPPORTUNITY COSTS AND WATER RESOURCE USE,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W74-03909

REGIONAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W74-03912

EFFECT OF ARTIFICIAL WATER AERATION ON BASIN ALGAL FLORA, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W74-03918

WEED CONTROL IN SUGAR BEET CROPS IN THE KOSOVO REGION, (IN SERBO-CROATIAN),
Agricultural Inst., Pristina (Yugoslavia).
For primary bibliographic entry see Field 3F.
W74-03943

COMMON PROPERTY, CONGESTION, AND ENVIRONMENTAL POLLUTION,
Wisconsin Univ., Madison. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W74-03958

ACCOUNTING FOR POLLUTION: POLLUTION ABATEMENT AND THE NATIONAL PRODUCT,
Michigan State Univ., East Lansing. Dept. of Economics.
M. Weinrobe.
Lad Economics, Vol 49, No 2, p 115-121, 1973. 2 ref.

Descriptors: *Gross National Product, *Welfare(Economics), *Pollution abatement, *Measurement, Technology, Industrial production.

Identifiers: *Pollution abatement devices, Social accounting, Pollution control capital.

Products creating pollutants provide two forms of externalities reducing physical productivity and direct individual satisfaction. A method to account for pollution abatement devices (PADs) in national accounts is examined. PADs reduce losses of the type noted above, although they create no new goods by themselves; they represent intermediate goods necessary to attain reductions in pollution losses and, therefore, should not be added to the national product. Two cases are examined to illustrate this point: Under full employment conditions, the productions of PADs represent sacrifices of other goods. The proper accounting method would be to subtract the cost of the PAD's from the present national product and add the expected reduction in pollution losses. Under conditions of less than full employment, it may not be necessary to subtract the production cost of PADs, since the resources consumed may have no opportunity cost. While the theory appears clear, the difficulty in ascertaining the value of the reduction of pollutant losses arising from the use of PADs has led to the use of production costs as a proxy. In full employment, GNP would not change as a result of the calculations--in fact it may either increase or decrease. (Schroeder-Wisconsin)
W74-03959

THE POLLUTION SUB-SYSTEM,
For primary bibliographic entry see Field 6G.
W74-03964

CLEANING UP A RIVER,
C. Kennedy.
Underwater Naturalist, Vol 7, No 4, p 4-12, (1973). 1 map, 4 photo, 8 chart.

Descriptors: *Baseline studies, Sewage treatment, *Outfall sewers, *Pollution abatement, *Shallow water, *New Jersey, Water quality, Water pollution, *Sewerage, Chemical analysis, Tides, Winds, Abatement, Water quality control, Rivers.

The American Littoral Society conducted a study of the Navesink River in New Jersey upon learning that the river's basin was to undergo thorough seweraging within a few years. The society thought it would be useful to record the state of the river before its pollution abatement started, so that the results of abatement could be measured by subsequent studies. The discharge from sewage outfalls was the major source of pollution in the river. The Littoral Society's river study established a water quality baseline with the major source of river pollution still in operation. (Comfort-Florida)
W74-03968

WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W74-03972

ASSAULT ON A LAKE,
J. McCaul.
Environment, Vol. 14, No. 7 p 33-39, September, 1972. 3 photo, 17 ref.

Descriptors: *Federal Water Pollution Control Act, *Waste disposal, *Lake Michigan, *Public health, *Municipal wastes, Water pollution, Chemicals, Detergents, Sewage, Illinois, Legislation, Effluents, Environmental effects, Water policy, Water quality, Regulation, Water pollution sources, Industrial wastes, Eutrophication, Biochemical oxygen demand, Water pollution control.

In 1968 because of the serious pollution of Lake Michigan, the then governor of Illinois called an interstate conference under the provisions of the federal water pollution control act to discuss the problem, recommend solutions, and write regula-

tions to control the pollution of the lake. Some of the problems of the lake were industrial pollution from oils, sulfates, and other chemicals as well as municipal sewage and agricultural runoff that produced overfertilization of inshore waters, thereby causing eutrophic problems. The biological concentration of these long-lived contaminants defy the concept of dilution upon which much waste disposal engineering rests. The potential damage to human health is difficult to quantify. The early pattern of thinking about waste disposal still persists today with only a token integration of insights provided by the biological sciences. Today's technology of water pollution control is based on pragmatic concepts that need thorough reevaluation if a comprehensive science is to be developed. (Daniels-Florida)
W74-03975

THE POTOMAC, WATER QUALITY PLANNING.
Interstate Commission on the Potomac River Basin, Bethesda, Md.
Proceedings of a Seminar held at New Carrollton, Maryland, May 10, 1973. 32 p, 3 fig.

Descriptors: *Interstate commissions, *River basin commissions, *Potomac River, Interstate compacts, Water resources, Basins, River basins, River basin development, Water quality control, Economics, Pollution, Land use, Planning, Water supply.

The topics discussed in this seminar include: the Water Resources Council and Basin Planning, Legislative Goals and Constraints for Water Quality Planning, Federal Water Quality Planning Requirements, the proposed Potomac River Basin Compact, Economics in Planning, and Citizen Participation in the Planning Process. The full text of each presentation is included along with a summary. The Commission has plans to promote and realize a Basin-wide effort on planning. The program includes: evaluation of non-point pollution sources, loading allocation system, land-use planning, water supply, monitoring of water quality and analysis of trends, and coordination of all planning activities in the Basin. (Sears-Florida)
W74-03977

OIL ON THE WATERS: MODEST PROGRESS IN CLEANUP TECHNOLOGY,
J. Arehart-Treichel.
Science News, Vol 102, p250-252, October 14, 1972. 4 photo.

Descriptors: Oil spills, Oil industry, Oil pollution, Water pollution, Water pollution sources, Disasters, Oceans, Chemicals, Environmental control, Detergents, Equipment, Legislation, Coordination, Federal government, Water pollution control, Chemical wastes, Oil wastes.

With soaring international demands for energy and petroleum transport, it became inevitable that oil spills would occur. The United States along with the oil and tanker industries launched efforts to devise effective and nontoxic techniques to clean up oil spills. After several years of research and experimentation, results are beginning to show for effective cleanup. Thin-layer chemicals can be used to herd oil together and to thicken it, so it can be scooped from the water. Other commercially built devices, skimmers, and methods are being developed. The Coast Guard is stockpiling equipment in various areas so that it can be flown to the scene of any disaster. The Environmental Protection Agency has not recommended or required any particular cleanup approach, because the approach depends on location, types of equipment available, sea conditions and type of oil. Oil spill cleanups have also improved as personnel have become better trained. Also, more stringent laws have helped improve oil cleanups. (Daniels-Florida)
W74-03979

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

PETTERSON V. FROEHLKE (CHALLENGE TO DREDGING PERMIT ISSUED BY CORPS OF ENGINEERS).

For primary bibliographic entry see Field 6E.

W74-03983

COMMONWEALTH V. HARMAR COAL CO. (DENIAL OF MINE DRAINAGE PERMITS).

For primary bibliographic entry see Field 6E.

W74-03984

IOWA WATER POLLUTION CONTROL COMMISSION V. TOWN OF PATON (AUTHORITY TO COMPEL TOWN TO CHANGE ITS SEWAGE SYSTEM).

For primary bibliographic entry see Field 6E.

W74-03985

PORLAND PIPE LINE CORPORATION V. ENVIRONMENTAL IMPROVEMENT COMMISSION (CONSTITUTIONALITY OF A STATE STATUTE).

For primary bibliographic entry see Field 6E.

W74-03988

DISCLOSURE OF UNLAWFUL OIL DISCHARGE PROVIDES IMMUNITY FROM PROSECUTION,

A. O. Black.

Houston Law Rev., Vol 10, p 732-739, March 1973. 50 ref.

Descriptors: *Water pollution, *Water Quality Improvement Act, *Environmental control, *Oil Spills, Legislation, Discharges, Oil pollution, Water pollution sources, Navigable water, Pollution control, Pollution abatement, Water pollution control.

Identifiers: Coastal waters, Oil pollution act.

Under the Water Quality Improvement Act, any person, including a corporation, who discloses, to the appropriate authorities, evidence of an oil discharge prohibited by the act, shall be immune from all criminal prosecution based upon such evidence. The Water Quality Improvement Act of 1970 prohibits the discharge of oil from any source into the navigable waters of the United States. The court reasoned that the granting of immunity encourages the disclosure of unlawful discharges, implying that the immunity clause should be extended as broadly as possible so as to facilitate pollution abatement. This broad immunity even includes immunity from prosecution under other pollution control acts. However, it does not apply to prosecution supported by evidence gathered by independent means. (Daniels-Florida)

W74-03989

VILLAGE OF CORNWALL V. ENVIRONMENTAL PROTECTION ADMINISTRATION OF THE CITY OF NEW YORK (APPROVAL SOUGHT FOR INTERCONNECTION WITH AQUEDUCT).

348 N Y S 2d 319 (Sup Ct 1973). 6 p.

Descriptors: *Judicial decisions, *New York, *Aqueducts, *Water supply, *Water transfer, Water law, Legal aspects, Legislation, Cities, Tunnels, Pumped storage, Watersheds(Basins), Local governments, Water storage, Water rights.

Village-petitioner filed application with respondent for approval of interconnection with aqueduct, which carried water from upstate watershed area to New York City. The Water Supply Act allows any municipality through which the aqueduct passes, as a matter of right, to take and receive water from the aqueduct. Respondent withdrew conditional approval of the connection, contending it had no duty to permit connection if it entails an unreasonable risk of damage to the aqueduct, or to the supply of those served by the

aqueduct. Respondent further contended no duty existed because the connection was made necessary by an unreasonable abandonment by petitioner of its existing water supply, and that the petitioner's application was related to the plan of a public utility to construct a pump storage facility, and therefore was on behalf of that public utility and not the municipality. The New York Supreme Court for Orange County held that the right to connect with the aqueduct is not conditional upon the prior approval of the municipal objective in seeking the water supply, and that the connection will not pose danger to the aqueduct or the water supply of other municipalities. (Ritchie-Florida) W74-03995

HILLSBOROUGH COUNTY ENVIRONMENTAL PROTECTION COMMISSION V. FRANDORSON PROPERTIES (DELIBERATE DESTRUCTION OF MANGROVES IN TIDAL WATERS NOT FORBIDDEN).

For primary bibliographic entry see Field 6E.

W74-03996

INTERSTATE COMPACTS AND REGIONAL WATER RESOURCES PLANNING AND MANAGEMENT,

For primary bibliographic entry see Field 6E.

W74-04000

KENTUCKY POLLUTION ABATEMENT AUTHORITY.

For primary bibliographic entry see Field 6E.

W74-04002

DEPARTMENT OF NATURAL RESOURCES-WATER RESOURCE.

For primary bibliographic entry see Field 6E.

W74-04005

PLANNING AND ZONING-LAND SUBDIVISIONS.

For primary bibliographic entry see Field 6E.

W74-04006

FRIENDS OF THE EARTH V. ARMSTRONG (ENVIRONMENTAL PROTECTION SUIT).

For primary bibliographic entry see Field 6E.

W74-04007

UNITED STATES V. TOBIN PACKING CO. (VIOLATION OF RIVERS AND HARBORS ACT).

For primary bibliographic entry see Field 6E.

W74-04008

OHIO V. CALLAWAY (INJUNCTION ACTION FOR FAILURE TO COMPLY WITH NEPA).

For primary bibliographic entry see Field 6E.

W74-04009

UNITED STATES V. CANNON (INJUNCTION AGAINST VIOLATION OF RIVERS AND HARBORS ACT).

For primary bibliographic entry see Field 6E.

W74-04010

UNITED STATES V. UNITED STATES STEEL (REFUSE ACT VIOLATION).

For primary bibliographic entry see Field 6E.

W74-04011

WATER POLLUTION CONTROL.

For primary bibliographic entry see Field 6E.

W74-04015

LITTERING OF PROPERTY AND WATERS.

For primary bibliographic entry see Field 6E.

W74-04017

SUPERVISION OF OIL, GAS, AND NATURAL DRY GAS WELLS.

For primary bibliographic entry see Field 6E.

W74-04018

FLORIDA WATER RESOURCES ACT OF 1972.

For primary bibliographic entry see Field 6A.

W74-04019

THE FUTURE OF WATER QUALITY CONTROL.

R. K. Golemon.

Texas Bar Journal, Vol 36, p 505-514, June 1973. 126 ref.

Descriptors: *Federal Water Pollution Control Act, *Water Quality Act, *Water quality standards, *Baseline studies, *Legal review, Legislation, Abatement, Water pollution control, Effluents, Wastes, Industrial wastes, Toxins, Law enforcement, Water quality, Discharge.

Identifiers: State permit program.

Some of the more important provisions of the Water Pollution Control Act Amendments of 1972 are reviewed. The change in the enforcement mechanism of the Federal Water Pollution Control Program is described. Previously water quality standards, i.e., standards for the quality of the water in the receiving stream were to be set as the control mechanism. Now the basis of pollution prevention and elimination will be the application of effluent limitations, i.e., requirements on effluent stream quality at the point of discharge. The two phase program established for application and enforcement of effluent limitations is analyzed and criticized. Also discussed are the amendments which provide for revision and updating of stream water quality standards established under the Water Quality Act of 1965, the permit system for discharges including the permanent state permit program, the toxic and pretreatment effluent standards and various general provisions. These general provisions include plant inspection, monitoring of equipment and gaining access to records by the Environmental Protection Agency and the greatly expanded role of federal enforcement authority with respect to water pollution. (Gragg-Florida) W74-04026

OAKLAND INNER HARBOR, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, San Francisco, Calif.

For primary bibliographic entry see Field 8A.

W74-04027

SAFE DRINKING WATER ACT OF 1972-S.3994.

Report of Senate Comm. on Commerce on S.3994, (Together with Supplemental Views) 92nd Cong.

2d Sess, September 15, 1972. 43 p.

Descriptors: *Water quality standards, *Legislation, *United States, *Potable water, Environmental sanitation, Public health, Water purification, Water utilization, Governments, Legal aspects, Water quality control, Water treatment.

The proposed Safe Drinking Water Act of 1972 would establish a program within the Environmental Protection Agency to regulate drinking water quality. Currently, the regulation of public drinking water systems is primarily a state responsibility. The federal government does exercise some control over drinking water aboard interstate carriers but that authority is limited to prohibiting the use of contaminated water. The proposed legislation provides that EPA establish minimum federal

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Water Quality Control—Group 5G

drinking water standards prescribing maximum limits for contaminants as well as standards for the operation and maintenance of drinking water systems and surveillance, monitoring, site selection and construction standards for public water systems to assure safe dependable drinking water. The EPA would also establish recommended standards to assure esthetically adequate drinking waters, although the states will be primarily responsible for enforcing the standards. The federal government will act only if the states fail to act in cases of imminent hazard. The Act further provides that a National Drinking Water Council be established to advise the administrator on scientific and engineering matters. (Mockler-Florida)
W74-04030

HIGH SEAS INTERVENTION: PARAMETERS OF UNILATERAL ACTION,
For primary bibliographic entry see Field 6E.
W74-04031

THE OCEAN DUMPING CONVENTION—A HOPEFUL BEGINNING,
T. L. Leitzell.
San Diego Law Review, Vol 10, No 3, p 502-513, May 1973. 46 ref.

Descriptors: *Water pollution, *Law of the Sea, *International law, *Treaties, *Pollution abatement, Aquatic life, Marine fisheries, Water pollution control, Organizations, Marine biology, Ocean water, Impaired water quality, Ecology, Environmental control, Waste disposal.

The Convention on the Prevention of Marine Pollution By Dumping of Wastes and Other Matter in the Oceans is viewed as a positive step toward global pollution control. The participating nations agreed the real force of the convention was in the controlling of vessels and aircraft in the ports of the contracting parties when loading materials for dumping. The basic thrust of the convention was to prohibit all dumping of wastes or other matter in the sea, with three categories of activities excluded. There was difficulty in formulation of the convention's Articles, but the regulatory provisions appeared relatively straightforward in the final draft. Great dependency was put on National Administrators and it was felt the Marine Protection, Research and Sanctuaries Act of 1972 would give greater meaning to the convention. Provisions were set forth for future institutional arrangements. The jurisdiction problem, the most contentious of the negotiations, was left more or less unanswered, however, all nations agreed action must be taken as soon as possible. Amendment procedures were also set up. (Sutton-Florida)
W74-04032

ESTUARIES UNDER ATTACK,
Oregon State Univ. Extension Service, Corvallis. Marine Advisory Program.
For primary bibliographic entry see Field 6G.
W74-04033

LEVELS OF ASSESSMENT,
Upper Mississippi River Basin Commission, Twin Cities, Minn.
For primary bibliographic entry see Field 6B.
W74-04035

WATER COMMISSION ENDORSES USER PAY CONCEPT,
Arkansas Wildlife Federation, Inc., Dardanelle.
For primary bibliographic entry see Field 6E.
W74-04036

DEVELOPMENTS IN WATER UTILITY LAW, 1972-1973, AMERICAN BAR ASSOCIATION REVIEW.

Journal American Water Works Association, Vol 65, No 11, p 690-699, November 1973. 1 tab.

Descriptors: *Legislation, *Water law, *Legal aspects, *Waste disposal, *Utilities, Pollution, *Pollution abatement, Planning, Environmental effects, Social aspects, Discharge, Waste water disposal, Profit return, Water pollution.

An overview is presented of recent legal developments relevant to the water utility industry. In 1972 Congress passed over the President's veto a 24.6 billion dollar Water Pollution Control Act to provide states and municipalities with sewage control funds for the next three years. The House of Representatives sustained Nixon's veto over the Rural Water and Waste Disposal Plant Program which would have authorized rural water and sewer systems. Now in the development stage is legislation on safe drinking water standards supported by the administration. Prosecutions for violations of the Refuse Act of 1899 have been stymied by a federal court's decision holding that until the Environmental Protection Agency establishes a permit-system prosecution for discharges will not be allowed. Congress has also passed a bill prohibiting dumping of waste and materials in the oceans, coastal waters and Great Lakes. The Supreme Court held Florida's strict no-fault liability Oil-Spill Prevention and Pollution Control Act valid. Various other actions and legislation of a statewide basis are reported including public service commission jurisdiction, rate bases, rate of return for public utilities, expenses, revenues, interim relief, and customer service and billing. (Silber-Florida)
W74-04037

TREATMENT OF HAZARDOUS MATERIAL SPILLS WITH FLOATING MASS TRANSFER MEDIA,
 Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W74-04043

FABRIC BOOM CONCEPT FOR CONTAINMENT AND COLLECTION OF FLOATING OIL, CONSULTEC, Rockville, Md.

P. E. Bonz.
Copy available from GPO Sup Doc as EPI.23:670/2-73-069, \$1.00; microfiche from NTIS as PB-228 049 \$1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-069, September 1973. 63 p, 5 fig, 2 tab, 15 ref. EPA Project 15080 FWM. 68-01-0139.

Descriptors: *Water pollution control, *Oil spills, *Flow separation, Running waters, Fabrics, Feasibility study, Oil, Oil-water interfaces, *Oil pollution, Separation techniques, High flow, Pollution abatement.

Identifiers: Floating oil, Oil containment, Oil collection, *Oil boom, Hydrophilic fabric.

The feasibility of applying the concept of oil-water separation by means of woven hydrophilic fabric to a floating oil containment boom was investigated through a series of model tests. A preliminary model boom configuration was developed and towed at speeds to 0.686 meters/sec (2.25 ft/sec) in both calm water and waves. Oil retention performance of this model was clearly superior to that of a conventional flat plate boom of comparable draft in the environment investigated. A larger model of similar configuration demonstrated no oil leakage when towed at 0.77 meter/sec (1.5 kt) in calm water. While further detailed analysis, engineering, and testing is required to fully examine this concept, it appears that a properly designed flexible boom which uses a hydrophilic skirt material offers significant

potential both as a containment device for floating oil in high current situations and as a high-speed collecting device. (EPA)
W74-04044

U-TUBE AERATION,

Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 5D.
W74-04046

THE IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART II. STRUCTURE OF THE INDUSTRY.

Sobtka (Stephen) and Co., New York.
For primary bibliographic entry see Field 3E.
W74-04076

THE ECONOMIC IMPACT OF POLLUTION CONTROL. AN OVERVIEW, A SUMMARY OF RESEARCH STUDIES.

Chase Econometric Associates, Inc., Philadelphia, Pa.
Available from the National Technical Information Service as PB-207 205, \$3.75 in paper copy, \$1.45 in microfiche. Prepared for Council on Environmental Quality, Washington, D.C., March 1972. 42 p, 1 tab.

Descriptors: *Pollution abatement, *Economic impact, *Industries, Water pollution control, Air pollution, Food processing industry, Oil industry, Pulp and paper industry, Baseline studies, *Cost analysis.

Identifiers: Automobiles, Baking, Cement, Electric power generation, Iron foundries, Leather tanning, Nonferrous metals, Smelting and refining, Petroleum refineries, Steel making.

Studies of the economic impacts of water and air pollution abatement requirements on various industrial activities are presented in an overview. The general findings of the micro- and macroeconomic impact studies are summarized and their concentration on adverse impacts is noted. The significant positive economic impacts that can also be expected include: increased profits and employment in pollution abatement equipment suppliers, and industries that produce low-pollution products; also more efficient firms will absorb the market shares left by marginal firm closures. In addition, specific and average productivity increases may occur as a result of technological innovations, closure of less efficient marginal firms, and the general economic benefits of a cleaner environment. The macroeconomic analysis was found to overstate the net costs to society due to the national accounting framework's neglect of the benefits of a cleaner environment. (Weaver-Wisconsin)
W74-04077

ECONOMIC IMPACT OF ANTICIPATED PAPER INDUSTRY POLLUTION-ABATEMENT COSTS. PART III. ECONOMIC ANALYSIS.

Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service as PB-207 146, \$4.50 in paper copy, \$1.45 in microfiche. Report to Council on Environmental Quality, November 1971. 72 p, 6 fig, 29 tab, 2 append.

Descriptors: *Pulp and paper industry, *Cost analysis, *Pollution abatement, *Economic impact, Capital costs, Operating costs, Unemployment, Regional economics, Waste water treatment, Biochemical oxygen demand, Suspended solids, Costs, Sulfite liquors, Waste treatment, Pulp wastes, Air pollution, Oregon, Prices, Foreign trade.

Identifiers: Product sector impact, Indirect economic impact, Supplier industries.

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Group 5G—Water Quality Control

Specific dislocations of marginal paper mills and other changes anticipated as a result of the increased capital and operating costs the paper industry will face in meeting pollution control standards over the next five years are analyzed. Based on data reported by various public and private sources, specific capital and operating costs for water pollution controls applied to those product sectors of the industry which were expected to be most sensitive because of low tonnage production levels indicated a range from \$8.00 to \$25.00 per ton of product for normal operation with capital costs ranging from \$16,000.00 to \$51,000.00 per daily ton of capacity. Air pollution control was estimated to have an operating cost of \$1.00 per ton of product and capital costs of \$700.00 per daily ton of capacity. Financing of these costs is expected to occur by short-run price increases of 3.5% to 10% depending on the product sector. The tissue paper and special industrial paper product sectors will experience the greatest shut-down of marginal capacity with associated job losses, and indirect economic impacts are estimated on both a sectoral and regional basis. (See also W73-02941) (Weaver-Wisconsin)
W74-04078

AN INVESTMENT DECISION MODEL FOR CONTROL TECHNOLOGY, National Environmental Research Center, Cincinnati, Ohio.

R. M. Clark.

Available from the National Technical Information Service as PB-213 482, \$3.00 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Socioeconomic Environmental Studies Series EPA-R5-72-004, September 1972. 20 p, 5 ref.

Descriptors: Investment, *Decision making, *Environmental control, Technology, *Mathematical models, Incineration, Waste disposal, Operating costs, *Capital costs, Financing, *Construction costs, Waste disposal, Treatment facilities.
Identifiers: *Investment decision model.

Investment decisions in control technology for environmental management are dependent on borrowing and lending variables. A mathematical model is constructed in which the investment decision is divided into two stages: the total operating and capital cost decision and the investment cost decision. Thus, an efficient method for both the definition of variables important to each decision and the coordination of expenditures with incoming funds is developed. The costs involved with each investment decision are minimized in two stages. The first stage utilizes a fixed-charge algorithm to minimize the total operating and capital cost of a facility subject to operational constraints. The second stage minimizes the cost of financing construction using a linear programming algorithm. Characteristic capital and cost functions and an investment cost dependent on the rate of return associated with the bonds used to finance the capital expenditures were assumed for an example incinerator project. (Weaver-Wisconsin)
W74-04079

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES. COPPER. PART I. INTRODUCTION AND EXECUTIVE SUMMARY.

Charles River Associates, Inc., Cambridge, Mass. Available from the National Technical Information Service as PB-207 161, \$3.00 in paper copy, \$1.45 in microfiche. Prepared for Council on Environmental Quality, Washington, D.C., December 1971. 21 p, 1 fig, 2 tab.

Descriptors: Copper, *Industries, *Pollution abatement, *Economic impact, Economic analysis, *Cost analysis.
Identifiers: *Copper industry, Price policies, Industrial organization, Demand and supply trends, Technological change.

A summary of the two succeeding parts of this report gives a broad profile of the copper industry and an outline of the economic effects of pollution controls on the industry. An overview of the copper market and trends in production and consumption indicate that the United States is by far the largest consumer of copper and that its demand is subject to irregular fluctuations. Because ingot makers can alter proportions of metals in alloys, copper is subject to some short-run substitution which occurs most often with aluminum. The principal source of pollution in copper production occurs at the point of smelting where sulfur dioxide is emitted to the air. Water pollution problems arise in electrolytic refining. The world primary copper industry is highly concentrated with a high degree of vertical integration. Copper prices, government policies, and the industry's history are reviewed. Most important among the effects of abatement costs is a possible shift of smelting to foreign operations if abatement costs exceed \$0.02 - \$0.04 per pound. No long-run declines in employment are expected although Arizona is the most likely to be affected adversely by pollution abatement costs. (See also W74-04082) (Weaver-Wisconsin)
W74-04081

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES. COPPER. PART II. STRUCTURE OF THE INDUSTRY.

Charles River Associates, Inc., Cambridge, Mass. Available from the National Technical Information Service as PB-207 162, \$5.45 in paper copy, \$1.45 in microfiche. Submitted to Council on Environmental Quality, Washington, D.C., December 1971. 129 p, 4 fig, 22 tab.

Descriptors: *Economic impact, *Industries, Copper, Structure, Distribution, Geographic regions, Technology, Foreign trade, Prices, Federal government, *Arizona, *Pricing.
Identifiers: *Copper industry, Financial performance, *Industrial organization, Product supply trends.

In order to evaluate the effects of various anti-pollution measures, this second part of a three-part study of the copper industry describes the primary and secondary industries, geographic distribution of world copper production, mining and smelting production in the United States and the technology of mining, milling, smelting, and refining. Product consumption including refined copper, scrap, copper alloy, and ingot; end uses of copper; substitutions; and international trade patterns are discussed. The industry is structured on concentration, vertical organization, physical distribution, and conditions of entry. Pricing of copper is described by its price history, refined copper quotations, a model of the copper market, econometric estimates on price and 'income' elasticities of demand. The most important refined copper prices in the United States are the 'domestic producer price' and the 'custom smelter price.' Government policies include the copper stockpile program, trade policies, and price controls. A description of the domestic distribution of the industry includes mining, smelting, refining, employment, copper producing areas (particularly Arizona), other copper smelting states, and the financial performance of the United States industry. (See also W74-04081) (Auen-Wisconsin)
W74-04082

SOME MODELS FOR THE ECONOMIC EVALUATION OF THE ENVIRONMENT, Netherlands School of Economics, Rotterdam.

P. Nijkamp, and J. Paolini.
Regional and Urban Economics, Vol 3, No 1, p 33-62, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: Environment, *Evaluation, *Social aspects, *Environmental control, Theoretical analysis, Welfare(Economics), Expenditures,

Decision making, Future planning(Projected), Mathematical studies, Gross National Product, Dynamic programming, Resource allocation.

Identifiers: *Environmental quality, Implicit preference functions, Environmental expenditures, *Belgium.

The rise in the prosperity of industrial nations has become concomitant with changes in the environment and with resulting demands that the environment be preserved. Three models are given which attempt to recognize the existence of and changes in environmental preferences. A static model is first presented which uses an implicit preference function to estimate parameters that influence the intertemporal allocation of scarce resources between the environment and all other goods. The model, applied to 1953-69 Belgian data, shows a rise in relative preferences in favor of environment. The second model stands primarily as a transitional step to the third. It introduces time as a variable and suggests some implications on the evolution of welfare given hypotheses related to the evolution of relative preferences. The third model places environmental priorities in a dynamic context to aid in the study of the consequences of environmental policy. Techniques of optimal control are applied in order to solve optimal environmental policy for all respective values of the state variables. (Schroeder-Wisconsin)
W74-04083

EXTERNALITIES, ENVIRONMENTAL POLLUTION AND ALLOCATION IN SPACE: A GENERAL EQUILIBRIUM APPROACH, Oslo Univ. (Norway). Inst. of Economics.

F. R. Forsund.
Regional and Urban Economics, Vol 3, No 1, p 3-32, 1973. 29 ref.

Descriptors: *Model studies, *Resource allocation, *Indirect costs, *Spatial distribution, Environment, Air pollution, Water pollution, Waste assimilative capacity, Welfare(Economics), Decision making.

Identifiers: *General equilibrium analysis, Environmental economics, Environmental pollution, *Externalities.

Allocation rules relevant within a setting of major interdependences between man's economic activities and their effects and interaction on the natural environment are restated in order to emphasize their basis in the economic analysis and treatment of externalities. The model assumes that economic activities produce certain residuals which are received by Nature. These recipients provide two types of services to man: residual disposal and environmental activities such as recreation, and resource extraction. The effect of residual production is to reduce the level of environmental services provided by the recipient. A static general equilibrium analysis is used to consider the trade-offs involved in rational decision-making and thus, derive the first-order conditions for Pareto-optimal resource allocation. The possible existence of a decentralized linear pricing system to achieve the identified optimal solution is also considered. (Weaver-Wisconsin)
W74-04084

ECONOMIC AND SOCIAL PROJECTS WITH ENVIRONMENTAL REPERCUSSIONS: A SHADOW PROJECT APPROACH, Netherlands School of Economics, Rotterdam. For primary bibliographic entry see Field 6B. W74-04085

THE ENVIRONMENTAL COST OF ECONOMIC GROWTH,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
B. Commoner.

WATER RESOURCES PLANNING—Field 6 Techniques Of Planning—Group 6A

In: Energy, Economic Growth and the Environment, Forum conducted by Resources for the Future, Inc., April 20-21, 1971, Washington, D.C., p 30-65. (1971). 13 fig, 9 tab.

Descriptors: *Gross National Product, Technology, *Ecology, *Economic impact, Environmental effects, Natural resources, Human population, Pollutants, Industrial production, United States. Identifiers: *Economic growth, *Environmental costs.

The primary element of the ecosphere is the ecological cycle. In itself, the cycle is self-governing, maintaining a relatively steady state over time, unless stressed by an external agent. The economic system, which rations scarce resources, is highly dependent upon the stability of the ecosystem. For its own stability, however, the economic system is required to grow by increasingly extracting wealth from the ecosystem, reducing the system's ability to regenerate itself. Data summarized indicate that since 1946 emissions of pollutants have increased by 200-2000%. The hypothesis is that the size of the population, production or consumption per capita, and new technology has significantly increased pollutants. It is approximated that while population accounts for 40% of the increase, postwar technology has been the chief reason for the environmental crisis. The effects of this technical change is illustrated in agricultural production, textiles, manufacturing, detergents, packaging, and automobiles. There is a need for environmental impact inventories to examine the relationship between production, consumption, and waste disposal decisions. (Schroeder-Wisconsin)
W74-04088

AERATION AT WEIRS.

Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W74-04113

GENERALIZED SIMULATION MODELS FOR MASSACHUSETTS STREAMS,
Quirk, Lawler and Matusky Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 5B.
W74-04118

HYGIENIC EVALUATION OF A MACHINE FOR APPLYING GRANULATED HERBICIDES IN CANALS OF THE COLLECTOR-DRAINAGE NETWORK, (IN RUSSIAN), Vsesoyuznyi Nauchno-Issledovatel'skiy Institut Gigieni i Toksikologii Pestisidov, Kiev (USSR). V. S. Buryi, V. A. Zakordonets, A. T. Goshka, S. N. Kudovich, and D. Kh. Babakulyev. Zdravookhr Turkm. Vol 15, No 12, p 39-40. 1971. Identifiers: Air pollution, Canals(Collector), Diuron, Drainage networks, Granulated, *Herbicides, *Hygienic evaluation, Occupations, Public health.

Data are given on the average content of diuron in the air of the working zone of the SV-2.5 machine used for applying granulated herbicides to rid canals of vegetation. The content did not exceed the maximum allowable concentration (8 mg/m³).-Copyright 1973, Biological Abstracts, Inc.
W74-04166

DISPOSAL OF RADIOACTIVE WASTES INTO THE UNDERGROUND IN THE FEDERAL REPUBLIC OF GERMANY - A SURVEY ON PRACTICAL EXPERIENCE AND R AND D WORK,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5E.
W74-04171

IMPROVING WATER QUALITY MANAGEMENT PLANNING IN NONMETROPOLITAN AREAS.

National Area Development Inst. of Spindletop Research Inc., Lexington, Ky.
Superintendent of Documents, U.S. GPO, Wash., DC 20402 \$0.95. Environmental Protection Agency Report EPA 68-01-0194, January 1973, 75p.

Descriptors: Federal project policy, Federal jurisdiction, *Governmental interrelations, Institutions, *Planning, *Management, *Water quality standards, Regulation, *Rural areas, Administration, Legislation, Legal aspects, *State governments, *Coordination, *Interagency cooperation. Identifiers: *Nonmetropolitan area wide planning.

The findings and recommendations set forth are based on a field survey of three states, interviews with officials of EPA, HUD, EDA and FHA, and observations made by the project team in connection with other research and related activity in support of nonmetropolitan area development. The research focused on the four agencies' programs related to water quality management planning, EPA's planning guidelines, the EPA-HUD Joint Agreement on unified planning requirements and other attempts to devise a coordinated approach. Needs of nonmetropolitan areas to cope with both urban-type pollution problems and nonpoint sources peculiar to the rural setting were analyzed in terms of the capabilities of existing emerging institutions. It is concluded that because of the diverse situations which exist in nonmetropolitan areas, a coordinative planning approach focused at the substate district level would be more effective than an approach which places primary reliance on Federal level interagency agreements on detailed uniform planning requirements.
W74-04199

THE ENVIRONMENTAL AND REGULATORY ASPECTS OF THE BREEDER REACTOR,
Atomic Energy Commission Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-04238

EFFECTS OF THE FEEDER CANAL ON THE WATER RESOURCES OF THE FORT LAUDERDALE PROSPECT WELL-FIELD AREA,
Geological Survey, Miami, Fla.
J. McCoy.
Open-file report 73019, April 1973. 24 p, 12 fig, 2 tab.

Descriptors: *Water quality control, *Groundwater resources, *Saline water intrusion, *Florida, Water pollution control, Methodology, Dredging, Canals, Groundwater recharge, Water table, Water levels, Hydrologic data, Data collections, Water wells, Aquifer characteristics, Groundwater movement. Identifiers: *Fort Lauderdale(Fla), *Aquifer feeder canal.

Ever-increasing water demands of the rapidly growing Fort Lauderdale, Florida, area have required water managers to use expedient means for not only increasing the amount of freshwater for use but also for protecting the freshwater source from saltwater contamination. A Feeder Canal was dredged to increase recharge to the Biscayne aquifer in the vicinity of the Prospect well field. Freshwater is conveyed into the Feeder Canal from the perimeter canals of an inland water-conservation area by way of Middle River Canal. The Feeder Canal runs from the controlled reach of the Middle River Canal, along the south part of the Prospect well field, then back into the tidal reach of the Middle River Canal. Flow in the lower reach of the Feeder Canal is regulated by a control structure near Powerline Road. Comparison of water-level contour maps of the well field area before and after dredging of the Feeder Canal indicated that the canal has raised water levels in the southwest part of the well-field area.

During the latter part of the 1970-71 drought, the canal probably contributed about 3 million gallons of water a day to the Biscayne aquifer. (Woodard-USGS)
W74-04259

WATER QUALITY CYCLE-REFLECTION OF ACTIVITIES OF NATURE AND MAN,
California State Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 5B.
W74-04263

WAT'S NEW IN DEEP-WELL INJECTION,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.
For primary bibliographic entry see Field 5E.
W74-04265

PROTECTION OF SAPROPHYTES AS THE MAIN FACTOR IN A PROGRAM FOR PROTECTION OF WATER ENVIRONMENTS, (IN POLISH), Polskie Towarzystwo Przyrodnicze im. Kopernika, Warsaw.
E. Kocwowa.
Wszczesniak, 9, p 238-240. 1972.

Identifiers: *Bacteria, Environmental protection, *Saprophytes, *Water pollution, *Self-purification.

The importance of cooperation between technologists, biologists, hydrobiologists, microbiologists, biochemists and toxicologists in solving the problem of water pollution is discussed. The role of bacteria in self-purification of waters is presented with special emphasis on the following forms of microorganisms: proteolytic, amylolytic, peptolytic, lolytic, sacharolytic and lipolytic. Other types of microorganisms are also dealt with. A number of postulates which should be taken into consideration in water purification programs are listed.-Copyright 1973, Biological Abstracts, Inc.
W74-04297

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE OPTIMAL EXPANSION OF A WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Dept. of Chemical Engineering.

D. M. Himmelblau.
Availability from NTIS as PB-227 335 \$4.75 in paper copy, \$1.45 in microfiche. Final Technical Report, August 13, 1973. 131 p, 9 fig, 5 tab, 39 ref, append. OWRR C-3020(No 3673)(2).

Descriptors: *Water policy, *Decision making, *Optimization, *Systems analysis, Digital computers, *Regional analysis, *Computer programs, Water resources development, Analytical techniques, Mathematical models, Project planning.

One approach to the planning for a comprehensive water resources system is discussed together with the criteria used to evaluate the expansion of an existing water resources system. A model of a river basin that includes a number of possible dam sites available for future regulation of water, deterministic inputs, a network configuration, linear constraints, and capital investment and operating decisions made on a yearly basis was set up so that the operating policy and construction policy could be determined by optimization of an objective function. The system model does not include stochastic effects nor intangible benefits and costs. The optimization strategy includes the

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branch and bound method together with the out-of-kilter algorithm. The objective function is maximized over the set of alternative projects to give the sum of discounted present value of the net earnings of the system subject to water demands and various institutional, physical and budgetary limits. An example problem is solved and computer programs are listed together with appropriate documentation.

W74-03754

AN APPLICATION STUDY IN WATER DISTRIBUTION CONTROL,

General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

For primary bibliographic entry see Field 8C.

W74-03755

ALTERNATIVE FUTURES USING THE WOLLMAN-BONEM MODELS,

University of Southwestern Louisiana, Lafayette, Dept. of Statistics.

J. W. McFarland, and M. L. Hyatt.

Water Resources Bulletin, Vol 9, No 4, p 755-767, 1973. 8 fig, 9 ref.

Descriptors: Water supply, *Dynamic programming, *Water demand, Water reuse, *Water consumption, Forecasting, Water quality, Model studies, *Alternative planning.

Identifiers: *Wollman-Bonem model, Alternative futures, Sensitivity analysis.

The Wollman-Bonem model is used to predict the direction and relative magnitude of quantitative and qualitative changes in water use which occur over time and as a result of changes in technology or policy. The need to examine a number of alternative assumptions of demographic-economic growth which would yield a range rather than a point prediction is argued. For 22 regions, projections of water-using activities were made and multiplied by use coefficients to obtain future water demand for agriculture, mining, manufacturing, steam-electric and municipal users in 1980, 2000, 2020. The basic run of the model revealed withdrawal increases of 1.5 to 6 times by 2020, with steam-electric plants and agriculture the greatest consumers. Recycling could reduce withdrawals by nearly 75 percent by 2000 for electric plants. BOD wastes were projected to increase by 4 to 7 times, with industrial sources containing to be the largest contributors. A 50 percent increase in costs is estimated when quality parameters were raised from 4 to 6 mg/l dissolved oxygen. The basic run also shows water deficiencies arising in 5-16 of the 22 regions by 2020. (Schroeder-Wisconsin)

W74-03888

SYSTEMS SIMULATION OF ECONOMIC FACTORS AND THEIR RELATION TO THE WATER SYSTEM OF WYOMING'S PLATTE RIVER BASIN,

Wyoming Univ., Laramie. Water Resources Research Inst.

C. Phillips.

Available from the National Technical Information Service as PB-227 267; \$3.75 in paper copy, \$1.45 in microfiche. Water Resources Series No. 40, November 1973. 45 p, 18 fig, 2 append. OWRR A-005-WYO(1).

Descriptors: *Wyoming, Model studies, *Simulation analysis, Hydrologic models, *River basin development, System analysis, Planning, Regional analysis, Costs.

Identifiers: *Platte River basin(Wyo), *Economic models.

That portion of Wyoming within the North Platte River Basin is likely to feel substantial pressure for development in the next decade. The availability and cost of water will be important considera-

tions in future development plans for this area. The present economic structure of the Basin has been strongly influenced by existing water development projects. Future efforts to develop additional water supplies will be evaluated in terms of the benefits and costs associated with new and expanded growth opportunities, as well as the beneficial and detrimental impacts that will be imposed on the existing environmental and economic structure of the Basin. This study examines the potential for designing an economic model of the Basin, using simulation techniques of analysis, for use in evaluating development impacts that are likely to occur in the near future. A hydrologic model of the Basin is also being developed using simulation techniques, and it is intended that the two models will eventually be integrated.

W74-03892

GROUND-WATER HYDRAULICS IN AQUIFER MANAGEMENT,

Stanford Univ., Calif. Dept. of Geology.

For primary bibliographic entry see Field 4B.

W74-03913

SEQUENTIAL STOCHASTIC OPTIMIZATION FOR RESERVOIR SYSTEM,

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

For primary bibliographic entry see Field 4A.

W74-03914

UNCERTAINTIES IN HYDROLOGIC MODELS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 2A.

W74-03916

FLORIDA WATER RESOURCES ACT OF 1972.

Fla. Stat., sec. 373.013 to 373.201 (Supp. 1972).

Descriptors: *Florida, *Planning, *Legislation, *Water conservation, *Water law, Water pollution, Permits, Water resources planning act, Subsurface water, Surface water, Flood control, Drainage, Land management, regulation, Saline water intrusion, Water utilization.

Identifiers: *Administrative regulations, *Florida Water Resources Act.

The act declares the policy to the legislature to manage, conserve, develop, and utilize the state's water resources. All waters in the state are subject to this regulation unless they are specifically exempted. The Florida department of natural resources has power to do research and investigations into all aspects of water use and water quality, and to conduct a continuing study of those areas of the state where saltwater intrusion is a threat to freshwater resources. The department also has the responsibility of formulating a state water use plan in which consideration will be given to: (1) the maximum beneficial use of water; (2) environmental protection, drainage, flood control, and water storage; and (3) the prevention of wasteful water uses. When any change is made in the state water use plan, public notice followed by a hearing is required. The statute creates five regional water management districts which are under the control of the department of natural resources. The act sets forth all of the administrative, procedural and judicial requirements necessary to implement the act. (Sperling-Florida)

W74-04019

COST ANALYSIS OF OPTIONAL METHODS OF SHIPBOARD DOMESTIC WASTE DISPOSAL,

For primary bibliographic entry see Field 5D.

W74-04115

DESIGN AND COST ALLOCATION ALGORITHM FOR WASTE TREATMENT SYSTEMS,

Thayer School of Engineering, Hanover, N.H.

For primary bibliographic entry see Field 5D.

W74-04116

WATER-SUPPLY PLANNING IN DEVELOPING COUNTRIES,

North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.

D. T. Lauria.

Journal American Water Works Association, Vol 65, No 9, Part I, p 583-587, September 1973. 5 fig, 11 ref.

Descriptors: *Water supply, *Planning, *Water resources development, United States, *Economic efficiency, Benefits, Costs, Economics of scale, Mathematical models, Systems analysis, Design, Construction, Timing, Research, Regional analysis.

Identifiers: *Developing countries, Excess capacity, Mixed-integer programming, *Regional planning.

An overview is presented of the most fundamental water supply planning problems in developing countries. Considered are those United States water supply planning approaches which are applicable in such countries, and those which are not. The amount of excess capacity that should be provided in a particular water supply system is largely a function of economies of scale and the discount rate; thus, U.S. design-period standards should not be used abroad. Construction timing depends upon the tension between implementation costs and the value of publicly supplied water. Regional planning is required abroad because of the need to allocate national water-sector budgets. Regional planning, mixed-integer programming models developed to solve the budget-allocation problem are discussed. Planning for economic efficiency requires data on water supply benefits. To obtain such information: (1) Studies can be made for measuring benefits in pertinent markets such as labor, and the water market itself; (2) benefits can be set by value judgment and political fiat; and (3) benefits can be imputed. Much research and improved regional planning models are needed to better water supply planning in developing countries. Studies should be conducted abroad to obtain information on water supply benefits. (Bell-Cornell)

W74-04117

GENERALIZED SIMULATION MODELS FOR MASSACHUSETTS STREAMS,

Quirk, Lawler and Matusky Engineers, Tappan, N.Y.

For primary bibliographic entry see Field 5B.

W74-04118

COMPUTER-ASSISTED ACTIVATED SLUDGE PLANT OPERATION,

Ottawa Univ. (Ontario). Dept. of Civil Engineering.

For primary bibliographic entry see Field 5D.

W74-04119

A SOCIAL REPORT - MAN AND WATER, THE RELATIONSHIP BETWEEN SOCIAL PSYCHOLOGICAL SYSTEMS AND WATER RESOURCES DEVELOPMENT,

Abt Associates, Inc., Cambridge, Mass.

For primary bibliographic entry see Field 6B.

W74-04120

WATER-MANAGEMENT STUDIES OF A STREAM-AQUIFER SYSTEM, ARKANSAS RIVER VALLEY, COLORADO,

Geological Survey, Pueblo, Colo.

For primary bibliographic entry see Field 4B.

W74-04262

WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

6B. Evaluation Process

COMMUNITY WELL-BEING AS A FACTOR IN URBAN LAND USE PLANNING,

Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, D. R. Brogan, E. A. Laurent, and H. E. Baltimore.

Availability from NTIS as PB-227 339 \$6.00 in paper copy, \$1.45 in microfiche. Partial Completion Report No ERC-0174, January 1974, 218 p, 10 fig, 31 tab, 141 ref, 4 append. OWRR C-2064(No 3359)(1). 14-31-0001-3359.

Descriptors: *Georgia, *Social aspects, Area redevelopment, *Project planning, Aesthetics, Landscaping, *Urban sociology, Environment, Psychological aspects, Human behavior, Non-structural alternatives, Flood plain zoning, *Urban renewal, Urbanization, *Land use, Scenery, Law enforcement.

Identifiers: Crime, Social discord, Mental health, *Atlanta(Geo).

Many engineers, planners, sociologists, psychologists, and architects recognize that the well-being of residents of an urban community may be profoundly affected by the designs used for transportation, drainage, communication and other urban facilities. A better understanding of how the well-being of people living in an urban community relates to the physical features of their residential environment is important both to planners who desire to minimize any potential adverse effects from their design and professionals (primarily in mental health and law enforcement) who must deal with the problems symptomatic of a low level of well-being. Annual totals of 22 such symptoms were summed for 100 Atlanta city blocks. Also measured for each block were 116 physical characteristics, such as landscaping and nearby land use, and 106 social characteristics, such as population density and income. While the establishment of causal relationships was beyond the scope of this study, the associations developed by regression analysis demonstrated that physical characteristics are roughly as important as social characteristics in explaining well-being problems. Some problems are better explained by physical while others are better explained by social characteristics. The primary relationship is that physical features that attract many outsiders accentuate well-being problems in a residential community while those that isolate a community minimize such problems. Flood plain land uses can either attract or provide a protective barrier against adverse outside influences.

W74-03751

ALASKA WATER RESOURCES RESEARCH NEEDS FOR THE 70'S.

Alaska Univ., College. Inst. of Water Resources. Availability from NTIS as PB-227 244 \$4.75 in paper copy, \$1.45 in microfiche. Report No IWR-39, September, 1973, 155 p. (Edited by R. F. Carlson and J. Butler). OWRR A-038-ALAS(1).

Descriptors: Water policy, Water law, Lakes, *Alaska, Hydrology, Limnology, Groundwater, *Management, Snow, Ice, *Water quality, Sanitary engineering, Cold regions, *Research and development, Applied research, Basic research, *Resources development, Administration, Research priorities, Planning.
Identifiers: *Research needs.

The Institut sponsored a seminar which examined the water resources research needs for the state during the next decade. The seminar brought together as speakers and participants: public and private users, state and federal regulatory bodies, consulting engineers, researchers and interested citizens. The seminar proceedings presents the remarks of 16 speakers who discussed topics in water quality, water resources control, resources development and resources administrations. Also

included in the report are a keynote address, concluding remarks, a report of the Institute's advisory board meeting held the following day, and summary of the whole research examination effort. Research recommendations are given for the areas of water resource management aspect of fisheries management, recreational lakes, reservoir management, flood control, water resource management in cold climates, and urban water resource management.
W74-03757

PRELIMINARY INDICATORS OF INCOME/WEALTH REDISTRIBUTION ASSOCIATED WITH BUREAU OF RECLAMATION PROJECTS,

Utah State Univ., Logan. Dept. of Economics.
R. Willis, A. LeBaron, and H. Fullerton.

Available from the National Technical Information Service as PB-227 243; \$3.25 in paper copy, \$1.45 in microfiche. Utah Water Research Laboratory, Utah State University, Logan, Completion Report PRCWRR816-1, October 1973. 32 p, 8 fig, 17 tab, 37 ref. OWRR B-049-UTAH(2). 14-31-0001-3342.

Descriptors: *Income distributions, *Supplemental irrigation, *Utah, *Colorado, *Welfare(Economics), Income analysis.

Identifiers: *Bureau of Reclamation projects, Wealth, Economic well-being, Lorenz curves.

Social well being is an accepted subset of water investment feasibility criteria. The purpose of this study was to isolate income redistribution impacts conferred by the U.S. Bureau of Reclamation projects. Four project sites have been utilized to yield both pre and post project estimates of farm income and wealth. Production functions of the Cobb-Douglas type were estimated to yield information about factor shares, and thus enable inferences to be made about distribution of total product among the factors, which can be reduced to show changes in income/wealth distributions. Lorenz curves were developed to show changes in distribution of wealth and net income in terms of family enterprise, per acre, and per irrigated acre. Listing of individual farmers income and wealth measures are included to show movements (from-to) from pre to post project time periods. Results tend to confirm the hypothesis that larger farmers (in terms of acreage) tend to benefit in absolute terms more than smaller farmers; however, relative changes (measured in terms of per irrigated acre) show the small farmer benefiting from a project more than does the large farmer. Over 80 percent of the farm families studied shifted into higher or lower income categories (50 percent up, 50 percent down) following project implementation. About 80 percent of the farm families in the sample changed positions (75 percent up, 25 percent down) in terms of the wealth measures.
W74-03771

APPLICATION OF STATISTICAL METHODS IN HYDROLOGY (PRIMENENIYE STATISTICHESKIKH METODOV V GIDROLOGII).

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskii Institut Trudy, No 196, G. A. Alekseyev, and A. V. Rozhestvenskiy, editors, Leningrad, 1973. 267 p.

Descriptors: *Hydrology, *Hydrologic data, *Statistical methods, *Model studies, Correlation analysis, Regression analysis, Time series analysis, Discharge(Water), Runoff, Streamflow, Low flow, Forecasting, Probability, Markov processes, Statistical models, Variability, Fluctuations, Meteorology, Maps, Curves, Equations.
Identifiers: *USSR.

Statistical procedures useful in hydrology and statistical characteristics of hydrologic data are

examined in this collection of 14 papers published by the Leningrad State Hydrologic Institute. Statistical procedures and characteristics examined include statistical modeling of time series; estimation of homogeneity of statistical series and stability of their parameters; conformity of theoretical and empirical probability distribution curves; optimal spatial interpolation of precipitation and estimation of errors; use of multiple correlation in low-flow computations and in forecasts of minimum groundwater levels; and analysis of time correlation functions of annual runoff in the USSR. A mathematical description is given of thermal characteristics in deep bodies of water. (Josefson-USGS)
W74-03831

AN INDUSTRIAL POLLUTION INDEX, Winthrop Coll., Rock Hill, S.C. Dept. of Economics. For primary bibliographic entry see Field 5G.
W74-03889

NATIONAL WATER COMMISSION REPORTS.

Civil Engineering, ASCE (American Society of Civil Engineers), Vol 43, No 5, p 70-73, 1973. 2 fig, 3 tab.

Descriptors: *National Water Commission, Irrigation, Flood control, Water demand, Water distribution, Prices, Treatment facilities, Coastal areas, Recreation waste, Navigation, *Federal Government, State Government, *Regulation.

Identifiers: *National Environmental Policy Act, User charges.

The National Water Commission indicates support for the recently eroded National Environmental Policy Act. The act stresses the need for regional planning in water use projects, to balance conflicting interests over existing open space development. Criticism is levied, however, against use of the act to stop construction. The built-in opportunity for delay in development decisions is also criticized. The Commission approves the concept of one-stop licensing rather than the existing multi-agency approach. The Commission recommends that user charges be imposed on direct beneficiaries of water development projects, flood control projects and inland navigation, to cover costs. This requirement should be waived for the construction of waste treatment plants, recreation, fish and wildlife, and the coastal zones and estuaries. The Commission also recommends dropping prohibitions of inter-basin water transfer studies in the West, reexamination of existing rural-urban inequities in federal water programs and a realignment of governmental responsibilities. The federal government should take the lead in data collection, basic research and water transportation facilities; the state in controlling and preserving their own water resources. (Schroeder-Wisconsin)
W74-03890

SOCIAL ACCOUNTING APPROACHES TO WATER RESOURCE USE IN ECONOMIC DEVELOPMENT.

Auburn Univ., Ala. Water Resources Research Inst.

Available from the National Technical Information Service as PB-227 472; \$8.75 in paper copy, \$1.45 in microfiche. OWRR B-029-ALA(3).

Descriptors: *Economic impact, Water resources, *Social values, Model studies, Commercial fishing, Water pollution, *Regional development, Thermal pollution, Hydroelectric plants, Mercury, *Alabama, Input-output analysis, Graphical analysis, *Water utilization, Costs.

Identifiers: *Externalities, Opportunity costs, Russell-Spofford model, Social costs.

This collection of articles emphasizes the value of determining the costs associated with water-borne

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

externalities. Pecuniary, technical, marginal and inframarginal externalities are first defined and their effects on societies' production possibilities are examined. It is suggested that society can be the recipient of a 'free lunch' when technical externalities are accounted for. This concept is illustrated by showing economic gains which can be had without increased expenditures by separating antagonistic enterprises, or altering the location of industrial plants on a stream, and combining differing streams of societal effluent. A survey was made to determine the loss of commercial fishing income arising from a fishing ban on an Alabama lake caused by mercury pollution. Total income loss to fishermen was mitigated by shifting their resources to other uses; as a result, it appears that only 15 commercial fishermen suffered income losses. The effect of production, consumption and disposal decisions on level and form of residuals was also examined. The modeling effort illustrates the flow of residuals and costs arising from power generation from either coal or nuclear fuel. The effect of water quality on regional growth was examined using an input-output model. A decrease in usable water was traced to show its composite effect on income, consumption, and governmental expenditures and revenues. (See W74-03908 thru W74-03912) (Schroeder-Wisconsin)
W74-03907

CONCEPTS OF EXTERNALITIES AND SOCIAL COSTS,

Auburn Univ., Ala. Dept. of Economics.
M. M. Baker, M. Eckert, J. H. Blackstone, Jr., and D. R. Street.
In: Social Accounting Approaches to Water Resource Use in Economic Development, Auburn Univ., Alabama, School of Business Research Series 3, p 3-10, August 1972. 1 fig, 2 ref.

Descriptors: *Social impact, Planning, Economic efficiency, Welfare(Economics), *Costs, Pollution.

Identifiers: *Externalities, Technological externalities, Pecuniary externalities, Marginal externalities, Inframarginal externalities, *Social costs.

Private pollution costs paid by individual consumers and producers deviate from the costs imposed on society. Knowledge of this divergence has prompted society to ask for governmental intervention. According to economic theory, proper responses are based on knowledge of the kind of externality involved. Alternative external effects and their impact on proper governmental responses are defined. Pecuniary externalities do not change the production possibilities of a society and arise from competition within the market. Such externalities pose few efficiency questions but do affect income distributions. Technological externalities affect the production possibilities of a society and prevent efficient production. Marginal externalities cause changes in the production or cost of one firm, given a marginal change in the activity of the second firm. Inframarginal externalities are externalities or diseconomies which may cause changes in total production or cost in a firm given changes in the activities in a second, even though marginal changes in the second firm's activities may not create changes in the first firm's production or cost. Typically, government intervention is justified by efficiency criteria only under conditions of technological externalities. (See also W74-03907) (Schroeder-Wisconsin)
W74-03908

OPPORTUNITY COSTS AND WATER RESOURCE USE,

Auburn Univ., Ala. Dept. of Economics.
D. R. Street.
In: Social Accounting Approaches to Water Resource Use in Economic Development, Auburn Univ., Alabama, School of Business Research Series 3, p 11-18, August 1972. 1 fig, 4 ref.

Descriptors: *Economic efficiency, *Graphical analysis, *Welfare(Economics), Optimum development plans, *Water resources, Recycling, Salvage value, *Water utilization.

Identifiers: *Technological externalities, Edgeworth-Bowley trading box, Production possibility curve.

There exists a counter argument to the proposition that there is no such thing as a 'free lunch,' which is useful in analyzing externality problems in water resource use. A 'free lunch' is defined as a net increase in economic welfare resulting from a Pareto optimal rearrangement of resources, products or services from the status quo. The existence of a 'free lunch' is first illustrated using an Edgeworth-Bowley trading box, where each bargainer benefits as a result of the exchange. Net increases in welfare can also be derived from redirection of resources, services and products when externalities exist through reduction of damages, reduction of production costs, or transformation of negative externalities into positive factors. Net benefits are shown in three cases involving externalities. The first illustrates benefits from separation of antagonistic enterprises; the second shows benefits arising from alternative orderings of enterprises on water bodies; and the third shows benefits arising from alternative groupings of different wastes. (See also W74-03907) (Schroeder-Wisconsin)
W74-03909

THE ECONOMIC IMPACT OF THE BAN ON COMMERCIAL FISHING ON LAKE PICKWICK,

Auburn Univ., Ala. Dept. of Economics.
J. W. Granade.

In: Social Accounting Approaches to Water Resource Use in Economic Development, Auburn Univ., Alabama, School of Business Research Series 3, p 19-40, August 1972. 10 tab, 9 ref.

Descriptors: *Economic impact, *Commercial fishing, *Water pollution effects, *Costs, Measurement, Mercury, Income, *Alabama.

Identifiers: *Pickwick Lake(Ala).

In 1970 commercial fishing was banned at Lake Pickwick in Colbert and Lauderdale Counties, Alabama, after traces of mercury exceeding FDA standards were found. A study was conducted to measure an element of social cost generated by mercury pollution as commercial fishermen income loss. The total income loss must be assuaged by the transfer of resources to alternative uses to obtain the net loss of fishermen's income. An attempt by mail questionnaires and personal interviews was made to contact the 181 fishermen in the two counties holding commercial licenses. The 81 respondents fished three lakes, Pickwick, Wilson and Wheeler with a majority (44) fishing Pickwick. Of those fishing for income, a total loss of \$391/month, \$475/month, and \$145/month for the three lakes resulted from the ban. While data was insufficient to measure the effect of transferring resources, only 15 fishermen reported decreases in their income after the ban. The study assumed that the labor of 19 men over 50 was non-transferable. (See also W74-03907) (Schroeder-Wisconsin)
W74-03910

RESIDUAL INFORMATION MODEL WITH APPLICATION TO HEAT FROM THERMAL POWER PLANTS,

Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 5B.
W74-03911

REGIONAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES,

Auburn Univ., Ala. Dept. of Economics.

M. M. Baker, M. M. Yarbrough, and D. R. Street.

In: Social Accounting Approaches to Water Resource Use in Economic Development, Auburn Univ., Alabama, School of Business Research Series 3, p 90-112, August 1972. 8 fig, 2 tab, 1 append, 7 ref.

Descriptors: *Water pollution effects, *Regional economics, *Income analysis, Employment, Planning, Input-output analysis, *Water utilization.

Identifiers: *External diseconomies.

While the quantity of available water has not generally represented a constraint on growth in the United States, changes in water quality have become a critical factor in regional growth and stability. The effects of pollution on regional income and employment are examined. A simplified input-output model, including water-using and non-water-using industries, and the final demand sector are constructed. A decrease in usable water because of increased pollution is verbally traced through the matrix to show the direct and indirect effects on household income, consumption, and output and input decisions of regional industries. It is also suggested that public sector decisions will be affected because of changes in regional income and reduction of public facilities. Numerical examples are not given, however, to show the actual components of the matrix. An introduction to the basic identities of an input-output table is presented to facilitate the explanation and interpretation of income effects. (See also W74-03907) (Schroeder-Wisconsin)
W74-03912

WATER RESOURCES AND SOCIAL CHOICES,

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.

R. Burke, III, J. P. Heaney, and E. E. Pyatt.
Water Resources Bulletin, Vol 9, No 3, p 433-447, 1973. 5 fig, 30 ref. NSF GK-30829.

Descriptors: *Decision making, *Social participation, *Planning, Model studies, Social values, Social impact.

Identifiers: *Public participation, Bargaining arena.

The water resource planning process has become a cause rather than a cure of recent controversies. These controversies have been agitated by changes in population, technology, distribution of societal influence, and societal values. The need is demonstrated to integrate technical planning activities with societal process. A nonoperational analog to implement the integration is suggested. The technical planning process has often been modelled. Modelling of the societal process is more difficult, but recent developments in public participation programs provide a number of examples. Under the analog, the technical and participation models are assumed to follow parallel paths, exchanging information periodically through a bargaining arena. The arena performs a number of key tasks, including identification of participation groups, preferences, problem areas, and levels of acceptance of alternative plans. The model performs iteratively, with the plan modified until all participants are satisfied, or until the level of arena satisfaction is acceptable to the agency. Through the arena, policy can be specified at the local level and alternative social decision rules can be incorporated. A regional water quality management problem is used to illustrate the application of the model. (Schroeder-Wisconsin)
W74-03915

PYRAMID LAKE RECREATION DEVELOPMENT PLAN. INITIAL FACILITIES,

California State Dept. of Water Resources, Sacramento.

A. G. Thrapp.

Bulletin No. 117-13, May 1972. 12 p, 2 fig, 1 tab.

WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

Descriptors: *Recreation facilities, *Planning, *California, *Reservoirs, Fishing, Recreation demand, Wildlife, Benefits, Costs, Cost-benefit ratio, Capital costs, Boat launching ramps, Landscaping, Potable water, Beaches, Swimming, Estimated costs, Environmental sanitation.
Identifiers: Pyramid Lake(Calif.).

Pyramid Lake will be located in the Los Padres and Angeles National Forests in northwestern Los Angeles County. The lake is one of the major reservoirs of the State Water Project to be constructed in Southern California and will provide for power generation, storage, and regulation of water and a potential for fishery enhancement. In addition recreation opportunities will be provided by planned development which will include high-speed boating, water skiing, sailboating, fishing, picnicking, and swimming. Proposed facilities consist of a boat launching ramp, picnic units, landscaping, water and sanitary facilities, a swimming beach, and boat-in areas. Unit recreation benefits were established at \$1.45; the unit benefit value of trout fishing was established at \$2.50/angler-day. Capital cost of the initial onshore facilities is estimated at \$1,095,800 based on 1972 prices. Implementation of the fishery enhancement program will include an initial investment for a warmwater fishery of \$2,500 and an annual expenditure of \$40,000 for trout replenishment. A value of \$.30/recreation day per year was assigned to compute annual operations and maintenance costs. Based on a 50-year period of analysis at 5% interest, the total present worth benefit is estimated to be \$5,476,000 and the present worth cost about \$3,015,000. (Slattery-Wisconsin)
W74-03955

LOS BANOS RESERVOIR RECREATION DEVELOPMENT PLAN, California State Dept. of Water Resources, Sacramento.

F. S. Nevins.

Available from: State of California Documents Section, P.O. Box 20191, Sacramento, California 95820. Price \$1.00. Bulletin No. 117-11, April 1971. 15 p., 2 fig., 8 tab.

Descriptors: *Recreation facilities, *Planning, *Reservoirs, Water utilization, Capital costs, Wildlife, Sport fishing, Estimated cost, Cost-benefit ratio, Benefits, Fishing, Costs, Boating, *California, Camping, Swimming, Water sports.
Identifiers: *Recreation development, Los Banos Reservoir(Calif.), Picnicking.

Los Banos Detention Dam was constructed in the Los Banos Creek channel upstream from the California Aqueduct to protect the aqueduct and downshore areas from the higher flows of the creek and to provide fishing and recreational opportunities. When developed, the reservoir and surrounding land will accommodate boating, fishing, camping, picnicking, swimming, riding, and hiking. Initial recreation facilities would be constructed during the 1970-1980 period and would cost approximately \$463,000. The cost of developing both initial and future facilities is estimated to be \$3,080,000. These facilities would accommodate 425,000 recreation days of use annually by the year 2020. The fishery development and management costs include initial development at \$7,000 and annual management costs of \$13,000. The unit benefit value for recreation was established as \$1.59 for the period prior to 1980 and \$1.83 for 1980 and the years following. All recreation and fish and wildlife enhancement benefits and costs have been converted to 1970 worth value, based on a 50-year period of analysis at 5% interest. The total present worth benefit is estimated at \$4,300,000 and the present worth cost is estimated at \$3,300,000. The benefit-cost ratio for the plan is 1.3:1. (Slattery-Wisconsin)
W74-03956

EXTERNALITIES, SHADOW PRICES, AND BENEFIT-COST CALCULATIONS, Illinois Univ., Urbana. Dept. of Economics.

F. R. Shupp.

Quarterly Review of Economics and Business, Vol 12, No 4, p 91-94, 1972.

Descriptors: *Indirect benefits, *Tangible benefits, *Optimization, *Project benefits, *Cost-benefit ratio, Dam construction, Irrigation, Marginal benefits, Direct benefits.
Identifiers: Pecuniary externality, Technological externality.

Recent dialogues in benefit-cost literature have argued that such calculations should include technological externalities and exclude pecuniary externalities. A formal mathematical proof is presented to illustrate these facts. A dam used only for irrigation is first considered. A LaGrangean function is formed with a budget constraint on construction funds. The LaGrangean multiplier, the shadow price of the last dollar invested is computed from first order conditions shown to be the marginal benefit-cost ratio. Next, a technological externality is introduced in the form of a second dam which permits the construction of a smaller downstream dam with the same irrigation potential. The multiplier is shown to have increased, illustrating that the technological externality has some effect on the comparison of the resulting multiplier shows that the externality has no effect and can be ignored. The results are extended to include imperfect markets and distributional considerations. (Schroeder-Wisconsin)
W74-03960

INTEGRATING NATURAL RESOURCES INTO AREAWIDE AND LOCAL PLANNING: THE SOUTHEASTERN WISCONSIN EXPERIENCE, Southeastern Wisconsin Regional Planning Commission, Waukesha.

H. E. Chinkenbeard.

Descriptors: *Comprehensive planning, *Regional development, *Wisconsin, *Land use, *Planning, Regional analysis, Resource allocation, Soil surveys, Transportation, *Natural resources, Urbanization.
Identifiers: Planning commissions.

From the beginning, the seven county Southeastern Wisconsin Regional Planning Commission has recognized that identification of its natural resources is a vital element in sound planning. In 1962 the Commission undertook a comprehensive transportation study for the region. The Commission itself was expanded to 96 members to encourage interdisciplinary discussion. The initial step was to define the type and depth of data to be collected and to rank it according to its importance. Data were coded according to the U.S. Public Land Survey, with a quarter section representing a unit for which all applicable data could be delineated, coded, measured and mapped. The Commission's early activities were limited to the development of a regional soil survey. This inventory was considered particularly important because of the varying capacities of soils to handle waste material. From the survey a major report, 'Soils of Southeastern Wisconsin,' was published. The soils data have been a major element in the determination of land suitable for urban purposes, shaping land use plans and identifying prime agricultural land which should be protected from urban encroachment. Subsequent studies by the Commission have examined wildlife habitats, stream quality and recreational sites. Continuation of this program is considered essential to future urban development planning activities of the Commission. (Schroeder-Wisconsin)
W74-03965

LEVELS OF ASSESSMENT, Upper Mississippi River Basin Commission, Twin Cities, Minn.

G. Griebelow.

Water Spectrum, Vol 5, No 2, p 24-29, 1973. 6 photo.

Descriptors: *Water resource planning, *Water resource development, *Waste treatment, *Water utilization, *Mississippi River Basin, Water conservation, Irrigation, Navigation, Wildlife conservation, Flood control, Regions, Recreation, Watersheds, Pollution control, Pollution abatement, Cities, Assessment.

The Upper Mississippi River Basin Commission was established to study and plan for the problems and designated priorities of water resources within the basin. The studies are broken down to levels. Level A is a comprehensive regional or framework type. Level B studies involve general metropolitan areas, including their immediate river basin proximities. Level C studies will look at more detailed problems within the areas geographically designated in Level B. They will determine what specific action will be undertaken by the end of the decade. The studies may include tributary basins, sub-basins, multi-state political borders, economic regions or areas the Commission deems pertinent. The basin covers a watershed of 189,000 square miles, or 121 million acres. Concurrence of the governor of each state is needed prior to a study being done within that state. Advanced wastewater treatment facilities rank high among the basin's overall priorities, as does flood control through non-structural measures such as flood plain zoning. Recreational development, conservation of wildlife resources and water supply are also among the main concerns. Also considered as essential goals are continuing use of water for irrigation, year round navigation and development of commercial fishing industries. (Silber-Florida)
W74-04035

A GENERAL PROCEDURE FOR CONSUMPTION-DENSITY STUDIES, California Univ., Santa Barbara. Dept. of Economics.

For primary bibliographic entry see Field 6D.
W74-04040

THE IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART II. STRUCTURE OF THE INDUSTRY. Sobotta (Stephen) and Co., New York.

For primary bibliographic entry see Field 3E.
W74-04076

THE ECONOMIC IMPACT OF POLLUTION CONTROL: AN OVERVIEW, A SUMMARY OF RESEARCH STUDIES. Chase Econometric Associates, Inc., Philadelphia, Pa.

For primary bibliographic entry see Field 5G.
W74-04077

ECONOMIC IMPACT OF ANTICIPATED PAPER INDUSTRY POLLUTION-ABATEMENT COSTS. PART III. ECONOMIC ANALYSIS. Little (Arthur D.), Inc., Cambridge, Mass.

For primary bibliographic entry see Field 5G.
W74-04078

AN INVESTMENT DECISION MODEL FOR CONTROL TECHNOLOGY, National Environmental Research Center, Cincinnati, Ohio.

For primary bibliographic entry see Field 5G.

W74-04079

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES. COPPER. PART I. INTRODUCTION AND EXECUTIVE SUMMARY. Charles River Associates, Inc., Cambridge, Mass.

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

For primary bibliographic entry see Field 5G.
W74-04081

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES. COPPER. PART II. STRUCTURE OF THE INDUSTRY.

Charles River Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W74-04082

SOME MODELS FOR THE ECONOMIC EVALUATION OF THE ENVIRONMENT,

Netherlands School of Economics, Rotterdam.
For primary bibliographic entry see Field 5G.
W74-04083

EXTERNALITIES, ENVIRONMENTAL POLLUTION AND ALLOCATION IN SPACE: A GENERAL EQUILIBRIUM APPROACH,

Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 5G.
W74-04084

ECONOMIC AND SOCIAL PROJECTS WITH ENVIRONMENTAL REPERCUSSIONS: A SHADOW PROJECT APPROACH,

Netherlands School of Economics, Rotterdam.
L. H. Klaassen.
Regional and Urban Economics, Vol 3, No 1, p 83-102, 1973. 1 ref.

Descriptors: *Cost-benefit analysis, *Cost-benefit theory, *Environment, *Welfare(Economics), Decision making, Mathematical studies, Estimated benefits, Monetary benefits, Case study.
Identifiers: Specific project effects.

The traditional cost-benefit analysis depends upon consideration of both direct and future induced or autonomous changes in the target variable. However, such consideration has been limited by the inability to translate such effects into common monetary value or shadow price with the consequence that subjectively determined weights must be used. Consideration of this problem within a mathematical framework leads to the suggestion of different use of cost-benefit analysis, which allows ignoring evaluation of social and environmental factors by explicit and separate consideration of specific project effects on economic-technical, social and natural capital. A simplified example provides illustration of the technique in evaluating the construction of a dam with a highway. (Weaver-Wisconsin)
W74-04085

THE ENVIRONMENTAL COST OF ECONOMIC GROWTH,

Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5G.
W74-04088

A SOCIAL REPORT - MAN AND WATER, THE RELATIONSHIP BETWEEN SOCIAL PSYCHOLOGICAL SYSTEMS AND WATER RESOURCES DEVELOPMENT,

Abt Associates, Inc., Cambridge, Mass.
S. J. Fitzsimmons, and O. A. Salama.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver Federal Center, Denver, Colorado, November 1973. 428 p, 30 fig, 174 ref. Bur Rec Contract 14-06-D-7342.

Descriptors: Social project benefits, Social projections, *Social data, Data aggregation, Data synthesis, Public benefits, *Social psychology.

Identifiers: *Behavior, Demography, Human population, Indirect benefits, Long term planning, Optimum development plans, Planning, Political aspects, Benefits, Reliability, Social aspects, So-

cial change, *Social impact, Social mobility, *Social needs, Social participation, *Social values, Water policy, Water resources development, *Cost-benefit analysis.

This study examined the social-psychological relationship of man to water resources development and then constructed preliminary measures to assess the social benefits and costs to man of water development. The measures were designed to be capable of (1) integration with other measures (economic, environmental, and technical) and (2) aggregation (e.g., to regional and national levels). The fields of Sociology and Social Psychology were reviewed, and seven conceptual areas were identified: Individual; Group; Organization; Social Process; Social Maintenance and Change; Society; and Population. A similar review of Water Development literature identified 14 water functions, such as Ecology, Supply and Energy Recovery. These two groups of variables were arrayed upon one another. Three types of interactions were considered: social needs for water; water functions with positive social impacts; and water functions with negative social impacts. Based upon review of the research and theory of the fields, a large number of parameters of interactions were identified. These were reviewed in light of water program and policy considerations and more than 250 preliminary social measures were proposed. The issues of data collection and analysis; synthesis of social data with economic, environmental and technical data; and data aggregation were addressed. Recommendations were made regarding pilot testing of social measures, synthesis and aggregation of data, and future national water assessment activities.
W74-04170

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE IMPACT OF WATER POLLUTION ABATEMENT ON COMPETITION AND PRICING IN THE ALABAMA PAPER INDUSTRY,

Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W74-03752

THE ECONOMIC BENEFITS OF ABATING WATER POLLUTION IN THE STEEL, TEXTILE, AND PAPER INDUSTRIES IN ALABAMA,

Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W74-03753

AN APPLICATION STUDY IN WATER DISTRIBUTION CONTROL,

General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 8C.
W74-03755

COST ANALYSIS OF GROUNDWATER SUPPLIES IN THE NORTH ATLANTIC REGION, 1970,

Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-03815

GROUNDWATER RECHARGE FOR WASTE WATER RECLAMATION AND/OR STORAGE OF SUPPLIES: A COST COMPARISON WITH CONVENTIONAL METHODS,

Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 5D.
W74-03825

LOWER COST WATER HARVESTING METHODS,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W74-03952

PHYSICAL-CHEMICAL WASTEWATER TREATMENT PLANT DESIGN,

CH2M/Hill, Corvallis, Ore.
For primary bibliographic entry see Field 5D.
W74-03957

ACCOUNTING FOR POLLUTION: POLLUTION ABATEMENT AND THE NATIONAL PRODUCT,

Michigan State Univ., East Lansing. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-03959

A NEW APPROACH TO DOMESTIC WATER RATING,

I. D. Currahers.
Eastern Africa Economic Review, Vol 4, No 2, p 73-96, 1972. 5 ref.

Descriptors: *Water rates, *Costs, *Africa, Water demand, Water supply, Prices, Economic efficiency, Welfare(Economics), Discriminatory pricing, *Domestic water.

Identifiers: *Kenya, Marginal cost pricing.

While water rates in Kenya primarily reflect financial objectives, economic and social objectives also are considered. These objectives can be satisfied, respectively, by rates equal to average cost, marginal cost, or promoting redistribution, stability, or development. A majority of existing schemes in Kenya do not cover all costs, a result both of social considerations and inadequate collection methods. An examination of the economics of water systems reveals increasing returns to scale and decreasing average cost. Under these conditions marginal cost pricing can accomplish both social and economic objectives. Modifications of marginal cost pricing, including price discrimination, may also satisfy a financial objective that the system cover all costs. Policies should be enacted to encourage individual water connections, free communal facilities, long-run marginal cost pricing for industrial users, two-part tariffs on metered urban use, and rates reflecting zonal ability to pay for rural consumers. Under these conditions, it is predicted that individual connections would be subsidized initially with costs being fully met by 1989. If communal water is provided freely, a larger treasury subsidy would be required than at present. (Schroeder-Wisconsin)
W74-03963

AN INVESTMENT DECISION MODEL FOR CONTROL TECHNOLOGY,

National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W74-04079

OPTIMUM FORAGE PRODUCTION AND THE ECONOMIC ALTERNATIVES ASSOCIATED WITH GRAZING IRRIGATED WHEAT, TEXAS HIGH PLAINS,

Texas Agricultural Experiment Station, Bushland.
For primary bibliographic entry see Field 3F.
W74-04086

DIGITAL COMPUTER PROGRAMS FOR THE COST ENGINEER,

National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W74-04087

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6D. Water Demand

ALTERNATIVE FUTURES USING THE WOLLMAN-BONEM MODELS,
University of Southwestern Louisiana, Lafayette,
Dept. of Statistics.
For primary bibliographic entry see Field 6A.
W74-03888

SOME DATA ON THE WATER ECONOMY AND THE UTILIZATION OF WATER RESOURCES IN BULGARIA, INCLUDING IRRIGATION,
Bulgarian National Committee on Irrigation and Drainage, Sofia. Water Development Design Inst.
For primary bibliographic entry see Field 3F.
W74-03954

A GENERAL PROCEDURE FOR CONSUMPTION-DENSITY STUDIES,
California Univ., Santa Barbara. Dept. of Economics.
W. D. Morgan.
Journal American Water Works Association, Vol 65, No 11, p 707-709, November 1973. 1 photo, 1 tab.

Descriptors: *Forecasting, *Project planning, *Hydrologic data, *Adoption of practices, *Cost allocation, Administration, Waters demands projections, Potential water supply, Domestic water, Consumption use, Economics, Supply, Economic prediction, Future planning, Costs, Demand.
Identifiers: Density studies, Binary variables.

The problem of long and short term forecasting of water needs faces local water agencies. Described are the procedure used in the typical density study and how such a study is useful to the local agency in determining the average expected consumption per unit of time of any proposed residential development. These studies have various drawbacks. An alternative method of forecasting involves the use of multivariate regression analysis using binary variables. The use of a binary system would be easier and cheaper, and unlike the density method additional factors influencing water use could be utilized. An example is set forth and it is also shown how such a method can be used in conjunction with the established density studies. Binary variables which measure either the presence or the absence of particular characteristics avoid the high cost of data-gathering. (Sutton-Florida)
W74-04040

6E. Water Law and Institutions

WATER RESOURCES NEWSLETTER, JUNE 1973.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 4A.
W74-03774

NATIONAL WATER COMMISSION REPORTS.
For primary bibliographic entry see Field 6B.
W74-03890

LET'S ENFORCE THE RULES,
W. H. Graffey.
Canadian Business, p 58-59 and 64, May 1973.

Descriptors: Decision making, Regulation, Penalties(Legal), *Social values, Pollution abatement, *Political constraints, Water quality standards.
Identifiers: *Environmental standards, Enforcement.

In recent years, environmental improvement has emerged as a goal of industrial societies and indicates a change in societal values. Governments have responded by implementing environmental

standards and creating new regulatory agencies. Conflicts have arisen, however, in the implementation of these standards. First, enforcement has been hindered by the political implications of plant closings. Effective lobbying has led to delays in implementing standards. Additionally, criticism has been leveled at the existence of unequal enforcement between jurisdictions, which discourages the enforcement of standards. Each of these problems must be examined in order to encourage enforcement of the emerging value of environmental improvement. (Schroeder-Wisconsin)
W74-03891

DISTRIBUTIONAL IMPACTS OF ENVIRONMENTAL QUALITY MANAGEMENT: THE CASE OF FEDERAL GRANTS FOR WATER POLLUTION CONTROL,
New York State Coll. of Agricultural and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5D.
W74-03894

THE GROUND-WATER DEPLETION ALLOWANCE UNDER THE FEDERAL INCOME TAX,
Kansas State Univ., Manhattan. Dept. of Economics.
E. W. Bagley.
Natural Resources Journal, Vol 12, No 3, p 445-466, 1972. 2 tab.

Descriptors: *Water law, *Adjudication procedure, *Groundwater, *Taxes, *Water rights, Irrigation water, Water utilization, Water table, Water yield, California, Texas, Arizona, Kansas.
Identifiers: *Depletion allowance.

In 1961, a Federal court upheld a Texas ruling granting a cost depletion allowance deduction for groundwater pumping (Shubert) in the Ogallala formation in the Southern Plains of Texas and New Mexico. The court emphasized that groundwater depletion was allowed in Texas and suggested that the decline in saturation thickness, a method presently used for gas, provided an adequate measure. Neither the Internal Revenue Service nor subsequent litigation has extended the ruling to other areas. Its future extension depends particularly on state water laws and local groundwater conditions. The allowance requires that such depletions are permissible and that the right is itself marketable. Some states have limited withdrawal to perennial yield, thereby foreclosing depletion. Other traditional water-rights laws determine what rights the user has to the resource in order to claim a deduction. Determination of the actual deduction centers on its correlation with either the withdrawal by the user or the decline in the water supply, the latter used by Shubert. This problem arises because water can be pumped by adjacent land owners as well. It is important to recognize that there exists a difference between the economic and physical supply. Pumping costs may exclude exploitation of the entire physical supply. The present lack of litigation may represent both the state's limitation and the irrigator's desire to maintain a low visibility when withdrawals exceed recharging. (Schroeder-Wisconsin)
W74-03962

PEOPLE V. MACK: A SPORTSMAN'S DEFINITION OF NAVIGABILITY,
W. K. Shipley.
Environmental Law, p 68-73, Spring 1973. 15 ref.

Descriptors: *California, *Navigable waters, *Streams, *Riparian land, *Riparian rights, Sport fish, Recreation, Obstruction to flow, Injunction, Water law, Legal aspects, Competing uses, Fishing, Navigable rivers.

This case involves the navigability of a river. The river is twenty miles long and varies in depth and width and has not been used to carry any sort of commerce. Riparian land owners placed wires and cables across the river thus disrupting fishing by sportsmen who were not able to use their small boats along the river. These obstructions led to a suit. The state of California declared these cables to be obstructions of a navigable stream as a public nuisance and sought an injunction for their removal. Defendant land owners contend that the river was not a navigable stream and thus the state lacked the power to enjoin their actions. The court rejected the traditional commercial use definition of navigability as a sole test and upheld the injunctions. The court held that even though a stream is not or cannot be used as a highway for commerce, it is navigable if it is capable of being used by small pleasure boats for purely recreational purposes. (Daniels-Florida)
W74-03967

WATER RESOURCE COMMISSION.

Conn. Gen. Stat. Ann., sec. 25-4a, 25-5b, 25-5c (Supp. 1972), as amended, act 73-590, sec. 2, act 73-555, sec. 1, act 73-679, sec. 39, 40, 41 (1973), Pub. Acts of Conn.

Descriptors: *Connecticut, *Water resources, *Water resources development, *Flood plain zoning, *Water management(Applied), Legislation, Water, Non-structural alternatives, Water demand, Water utilization, Land use, Sewage, Sewage disposal, Natural resources, Environment, Environmental control.

Protection and preservation of natural resources and ecosystems are now required to be considered in granting or denying applications for permits to encroach on the flood plain areas established by the Connecticut commissioner of environmental protection. The Connecticut departments of environmental protection, health and the office of state planning are required to prepare and periodically update a statewide long range plan for the management of the state's water resources. These agencies shall identify quality and quantity of water available, project water demands, and make recommendations for water utilization, land use and engineering works, and also take into account recreational, agricultural, industrial and commercial water needs. The commissioner of environmental protection must regulate and compel sewage discharge systems to operate in such a manner as will conserve and protect the natural resources and environment of Connecticut. Financing the technical assistance necessary to implement the requirements of the act, and grants issued pursuant to it, are under the control of the managing director of the planning and budgeting division in the Connecticut department of finance and control. (Ritchie-Florida)
W74-03969

STUDY OF WATER RESOURCES AND MANAGEMENT.

Ind. Ann. Stat. secs. 27-1701 thru 27-1709 (1970).

Descriptors: *Legislation, *Water Resources Research Act, *Indiana, *Water resource development, *Planning, *Census, Water rights, Water management, Water resources, Water law, Comprehensive planning, Investigations.

A study committee is created made up of members from several Indiana state agencies, the state legislature and University officials. The committee is directed to make a comprehensive study and survey of water rights and water management including surface and ground waters. The study committee is directed to submit a written report of its findings and recommended legislation. The purpose of this water resources research act is to provide proper development, use and management of the state's resources based on sound and thorough

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knowledge and understanding of the location, extent, capabilities, limitations and characteristics of the basic water resources of the state. (Daniels-Florida)
W74-03970

GENERAL POWERS OF CITIES AND TOWNS—STREETS, ALLEYS, WATER-COURSES, SEWERS—CONTROL.

Ind. Ann. Stat. secs. 48-500 thru 48-503 (Supp. 1972).

Descriptors: *Control, *Legislation, *Indiana, *Cities, Regulation, Management, Water rights, Watercourse, Sewers, Drains, Lakes, Banks, City planning, Legal aspects, Jurisdiction, Water law, Governments, Water resources, Local governments.

A legislative grant of power is made to Indiana municipal governments. Except when otherwise provided by law, such municipalities shall have exclusive power over the streets, alleys, watercourses, sewers, drains, bridges and public grounds within its jurisdiction. (Daniels-Florida)
W74-03971

WATER POLLUTION.

Ill. Ann. Stat., ch. 111 1/2, sec. 1011, 1012, 1013 (Smith-Hurd Supp. 1973), as amended, act 78-862, sec. 11, 12, 13 (1973), Ill. Pub. Acts.

Descriptors: *Illinois, *Legislation, *Water pollution, *Water pollution sources, *Law enforcement, Environment control, Environmental effects, Administration, Pollution abatement, Water quality control, Federal Water Pollution Control Act, Governments, Permits, Water quality standards, Water quality act.

The title's purpose is to restore, maintain, and enhance the purity of the waters in order to protect health, property and the quality of life in the state of Illinois. This is to be done by assuring that no discharge is released into waters of the state without being given the degree of treatment or control necessary to prevent pollution. Any pollution is subject to such conditions as are required by state or federal law. The title authorizes the Pollution Control Board and Agency to adopt such regulations and procedures which will enable the state to secure federal approval to issue National Pollution Discharge Elimination System (NPDES) permits pursuant to the provisions of the Federal Water Pollution Control Act Amendments of 1972. Section 12 sets forth exactly what manners of polluting will be deemed unlawful and explains the permit system to be utilized. Section 13 outlines the regulations the Board will have power to prescribe and enforce. These include water quality standards, effluent standards, construction permits and certification of technical competency of operation personnel for sewage works. (Sutton-Florida)
W74-03972

PRIVATE RIGHTS IN WATERS.

N.Y. Sess. Laws, Ch. 664, sec. 15-0701, (McKinney 1972).

Descriptors: *Water rights, *Riparian rights, *Reasonable use, *Alteration of Flow, Prescriptive rights, Legislation, Banks, Ownership of beds, Relative rights, Damages, Impoundments, Lakes, Watercourses, Natural flow, Water law, Legal aspects, Diversion, Flow, Relative rights.

A declaration is presented of private water rights. Reasonable use by way of impoundment, withdrawal or obstruction of water is provided. However such activities are made unlawful and a cause of action for damages or injunctive relief is provided where the use is not reasonable. Thus the statute provides for a judicial determination of reasonableness. (Daniels-Florida)

W74-03973

SHORE EROSION CONTROL.

Md. Code Ann., art. 66C, sec. 756-758 (Supp. 1973).

Descriptors: *Legislation, *Erosion control, *Financing, *Planning, *Maryland, State governments, Future planning, Administration, Bank protection, Bank stability, Water control, Structural designing, Shores, Structures, Beach erosion, Shore protection.

The Maryland Department of Natural Resources shall develop and implement a public education program on all phases of shore and bank erosion. It shall review petitions for formation of shore erosion control districts and provide technical assistance to property owners, municipalities and counties with specific shore and bank erosion problems. The Department shall also design shore erosion control structures, provide for their construction, administer loans in support of this construction, supervise design and erection of the structures and prepare requests for fund appropriations. The Department shall cooperate with other necessary agencies in facilitating its functions and promulgate regulations to administrate and regulate its mandate. The Shore Erosion Control Construction Loan Fund to be administered by the Department shall provide interest-free loans for the construction of shore erosion structures. (Silber-Florida)
W74-03974

ASSAULT ON A LAKE,

For primary bibliographic entry see Field 5G.
W74-03975

THE POTOMAC, WATER QUALITY PLANNING.

Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W74-03977

WATER RESOURCES.

N.Y. Sess. Laws, ch. 664, sec. 15-0101 through 15-0317 (McKinney 1972).

Descriptors: *New York, *Water law, *Water resources, *Water pollution control, *Water quality, Water, Legislation, Permits, Water management, Water pollution, Public health, Legal aspects, Water supply, Water utilization, Water resources development, Water supply development.

The Water Resources Law, article 15 of the New York Environmental Conservation Law, was enacted to provide an adequate and suitable water supply, essential to public health. The policy requires that the waters be conserved and developed for all public beneficial uses through comprehensive planning, wise use, and development of water resources in order to meet present and future needs. The department of environmental conservation may make any investigations necessary for the discharge of its duties, and examine the books of any licensee or holder of a permit under this article. The department is empowered to bring actions, suits or proceedings necessary to enforce the provisions of the Water Resources Law, and also, with certain restrictions and limitations, exercise the power of eminent domain. The department shall establish or amend classifications of waters and adopt standards of purity and quality, and adopt and enforce regulations on the use of chemicals to maintain those standards. In addition, the department is authorized to exercise all the functions, powers and duties of the former Water Resources Commission and the former Water power and Control Commission. (Ritchie-Florida)

W74-03980

A BILL AUTHORIZING THE SECRETARY OF THE ARMY TO CONSTRUCT FLOODWATER CHANNELS.

Senate Bill 725, 93d Cong, 1st Sess (1973). 2 p.

Descriptors: *Flood control, *Flood protection, *Construction, *Legislation, Structures, Watersheds management, Erosion control, Land management, Channel, Channel improvement, Water control, Flood routing, Floodways.

Senate Bill S.725 was referred to the Committee on Public Works. The bill authorizes the Secretary of the Army to construct three flood-water channels for flood prevention and other purposes in the Lower Rio Grande Basin and nearby counties in Texas at an estimated cost of twenty-one million dollars. The Secretary of the Army is to seek reasonable assurances that an adequate land treatment program satisfactory to the Secretary of Agriculture will be installed to provide necessary protection to the watershed lands and planned structural measures. (Daniels-Florida)
W74-03981

PORT, HARBOR AND TERMINAL DISTRICTS; POWERS AND DUTIES; BONDS.

La. Const. art 14 sec 31 (Supp. 1973). 4 p.

Descriptors: *Louisiana, *Port authorities, *Harbors, *Governmental interrelations, Government finance, Dredging, Channels, Ships, Basins, Navigable waters, Eminent domain, Leases, Industrial production, Tax rates, Bond issues, Grants.

The Louisiana Constitution authorizes the state legislature to create port, harbor and terminal districts as political subdivisions of the state. These districts possess full corporate powers. They may fix their territorial limits and provide for their organization and government. Moreover, they may define their duties, powers and jurisdictions and delegate to themselves the authority to own, construct, operate and maintain docks, wharves, sheds, elevators, locks, steps, laterals, basins, warehouses and all other property and structures necessary for useful port, harbor, and terminal purposes. The districts may dredge and maintain shipways, channels, slips, basins and turning basins; cooperate with other governmental agencies in establishing, maintaining and operating navigable waterway systems; and acquire by eminent domain, purchase, lease or otherwise, the land necessary for such districts. The district may acquire industrial plant sites and acquire or construct industrial plant buildings. They may lease or sublease for processing, manufacturing, commercial and business purposes, lands or buildings. Finally, the districts can borrow funds, mortgage properties, and incur debts and issue bonds. (Napolitano-Florida)
W74-03982

PETTERSON V. FROELHLKE (CHALLENGE TO DREDGING PERMIT ISSUED BY CORPS OF ENGINEERS).

354 F. Supp. 45-50 (D. Oregon 1972).

Descriptors: *Legislation, *Conservation, *Structures, *Legal aspects, *Public lands, *Public rights, Environment, Streamflow, Dredging, Environmental effects, Federal project policy, Federal government, Concrete construction, Conservation, Constraints, Columbia River. Identifiers: National Environmental Policy Act.

Plaintiffs sought a declaratory judgment against the proposed expansion of the Portland International Airport, and the construction of the I-205 bridge across the Columbia River. The best method available involved filling in part of the river. The Federal Aviation Agency found the plans to be safe and efficient, and the Corps of Engineers issued a dredge and fill permit. Several federal environmental laws were enacted since the

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projects were begun. The National Environmental Policy Act (NEPA) requires federal agencies to make environmental impact studies before taking major action. Section 16 of the Airport and Airway Development Act requires the Secretary to insure that environmental effects are minimized in airport construction projects before granting federal assistance. Plaintiffs fear that dredging will impair the recreational and wildlife value of the area and lead to erosion of the riverbank. The United States District Court held that NEPA applies retroactively to a continuing project only if major action need be taken by a federal agency after its date of effect. The court ruled that since the Corps had to perform no such actions after issuing the permit, NEPA does not affect the permit. (Silber-Florida) W74-03983

COMMONWEALTH V. HARMAR COAL CO. (DENIAL OF MINE DRAINAGE PERMITS).

306 A.2d 308-321 (Pa. 1973). 14 p.

Descriptors: *Pennsylvania, *Coal mine wastes, *Permits, *Judicial decisions, *Mine drainage, Drainage practices, Mine acids, Industrial wastes, Coal mines, Wastes, Water pollution sources, Legal aspects, Water pollution, Drainage effects, Mine wastes.

The case involved mine drainage permits by two coal companies. The permits were denied by the Sanitary Water Board. The denial was affirmed by the Pennsylvania Supreme Court. The Court ruled that under the Clean Streams Law the Board could require coal companies to treat all drainage from its mining operation despite the fact that much of the drainage originated in adjacent inactive mines owned by other companies. The court also ruled that a total treatment requirement was not unduly oppressive in that it was not a prohibition but only resulted in an increase in the cost of operation. The court further stated that an aquatic study was not a prerequisite to the denial of a mine drainage permit. (Sears-Florida) W74-03984

IOWA WATER POLLUTION CONTROL COMMISSION V. TOWN OF PATON (AUTHORITY TO COMPEL TOWN TO CHANGE ITS SEWAGE SYSTEM).

207 N.W.2d 755-765 (Iowa 1973). 11 p.

Descriptors: *Iowa, *Abatement, *Municipal wastes, *Water pollution control, *Judicial decisions, Commissions, Solids, Sludge, Sewage, Sludge deposits, Surface water, Water pollution, Water pollution sources, Water law, Legal aspects, Cities, Disposal.

Plaintiff, Iowa Water Pollution Control Commission, discovered that defendant town was in violation of two standards prohibiting the discharge of sewage without removal of floatable and settleable solids and prohibiting municipal discharges into surface waters that would form sludge deposits. Negotiations culminated in a consent order. The Commission commenced contempt proceedings for the town's alleged disobedience of the consent order. The Supreme Court of Iowa held the Commission had authority to enter into a consent order with the town requiring the town to cease polluting, even though no hearing was held, and that the town had statutory authority to agree to the consent order. The court stated all polluters are to be treated equally and municipalities are not favored. (Sears-Florida) W74-03985

A BILL TO AUTHORIZE EXTENSIONS OF THE AMERICAN CANAL AT EL PASO, TEXAS.

House Bill 2924, 93d Cong, 1st Sess (1973). 3 p.

Descriptors: *Water loss, *Rio Grande River, *Mexico, *Legislation, *Canal construction,

Canals, Construction, Water supply, Rationing(Water), Water allocation(Policy), Operation and maintenance.

The House of Representatives Bill No. 2924 was referred to the Committee on Interior and Insular Affairs. The bill authorizes the construction of extensions of the American Canal at El Paso, Texas, and provides for its operation and maintenance. The bill's purpose is to attempt to salvage water losses and to facilitate cooperation between the United States and Mexico by providing for the equitable division of the waters of the Rio Grande. This bill authorizes money for the construction of the thirteen miles of canal extensions and all other powers needed by the Secretary of the Interior to appropriately carry out the purposes of this act. (Daniels-Florida) W74-03986

PORT OF PORTLAND V. AN ISLAND IN COLUMBIA RIVER (ACTION TO QUIET TITLE TO ALLUVIAL ISLAND IN COLUMBIA RIVER).

479 F.2d 549-552 (9th Cir. 1973). 4 p.

Descriptors: *Boundary dispute, *Judicial decisions, *Islands, *Columbia River, *Alluvial channels, Boundaries, Washington, Oregon, Accretion, Sediments, Alluvial fans, Fluvial sediments, Rivers.

Identifiers: Main channel, Widest channel, Interstate compact.

The issue involved in this case was the ownership of an island in the Columbia River which emerged as the result of alluvial deposits after both Oregon and Washington had been admitted as states. The River constituted the boundary between Oregon and Washington. An Interstate Compact in 1958 between Washington and Oregon placed the island within the latter state. The dispute arose from a 1929 conveyance by the State of Washington; it was thus necessary to determine the pre-1958 ownership of the island as the 1958 Compact would not invalidate such conveyance if Washington owned the island at the time. The determination revolves around the boundary of the State of Oregon which is the middle channel of the Columbia River. The United States Court of Appeals reversed the lower court's determination that the island belonged to Oregon because the river was divided by an island and the widest channel was to the north and the middle of the widest channel was the boundary. In remanding the court said that islands formed subsequently to 1859 are not to be considered in determining the boundary, that the boundary remains what it was in 1859, the varying center of the main channel. (Gragg-Florida) W74-03987

PORTLAND PIPE LINE CORPORATION V. ENVIRONMENTAL IMPROVEMENT COMMISSION (CONSTITUTIONALITY OF A STATE STATUTE).

307 A.2d 1-48 (Me. 1973). 48 p.

Descriptors: Oil, *Water pollution sources, *Maine, *Oil spills, Navigable waters, Environmental effects, Estuaries, Tidal effects, Legislation, Aquaculture, Coasts, *Oil pollution, Beaches, Public lands.

Identifiers: Coastal Conveyance Act, *Coastal waters.

Actions were brought by plaintiff petroleum corporations for judgments declaring that the Coastal Conveyance Act, and act relating to overwater transfers of petroleum, violates various provisions of the United States and Maine constitutions. The legislature of Maine passed legislation designed to diminish pollution of the environment. The purpose of the Coastal Conveyance Act is to maintain the seacoast for public and private recreation and for commercial use for food production, and to

preserve these areas it must use effective methods to maintain coastal waters, estuaries, tidal flats, beaches and public lands adjoining the seacoast. The court found that the Maine legislature by passing the act had a legitimate object to effectuate and that it molded and modeled the exercise of its powers as its wisdom and the public interest required and that such act was not unconstitutional. (Daniels-Florida) W74-03988

DISCLOSURE OF UNLAWFUL OIL DISCHARGE PROVIDES IMMUNITY FROM PROSECUTION.

For primary bibliographic entry see Field 5G.

W74-03989

CANALS AND WATERWAYS.

Ill. Ann. Stat., ch. 19, sec. 8 (Smith-Hurd Supp. 1973), as amended, act 78-718, sec. 6 (1973) Public Acts.

Descriptors: *Water law, *Illinois, *Canals, *Administrative agencies, *Legislation, Canal design, Conveyance structure, Engineering structures, Hydraulic structures, Water control, Structures, Dams, Locks, Rivers, Riparian rights, Land use, Management, Public rights, Ice, Navigation, Water rights, Water management(Applied).

The Illinois Department of Conservation is authorized to control and manage the Illinois and Michigan canal, including its feeders, basins, apertures, locks and dams in order to improve the navigation of the Illinois and Little Wabash rivers. The department shall have authority to hire personnel, prescribe reasonable rules and regulations in respect to all matters connected with the navigation and use of the canal, locks and dams and transportation on or through the same. Furthermore the department shall establish and collect reasonable rates of toll, sell and dispose of any machinery, fixtures, materials and personal property not required for the proper management, construction, repair and use of the canal, locks, dams and other improvements. The department may lease canal lands, elevators, adjoining state property, mineral rights and water power to the highest bidder when public notice is provided. The department may also lease to the highest bidder the exclusive rights to take ice from any waterway within its authority and sell or convey riparian rights or canal lands now owned by the state. (Silber-Florida) W74-03990

FISHERMAN QUOTAS: A TENTATIVE SUGGESTION FOR DOMESTIC MANAGEMENT.

Rhode Island Univ., Kingston. Law of the Sea Inst.

F. T. Christy, Jr.

Occasional Paper Series, Occasional Paper No 19, November 1973. 7 p.

Descriptors: *Marine fisheries, *Commercial fishing, *Planning, *Permits, *Fish management, Fisheries, Fish conservation, Commercial fish, Fishing gear, Fishing.

If United States domestic fisheries are to economically rehabilitated drastic steps are required. Among these steps may be the establishment of some means to limit the amount of fishing effort. The suggestion for limiting fishing effort is not offered as a solution but as a basis for discussion. There are now two major approaches to the establishment of limits or control - a licensing system limiting the number of vessels in a fishery and a system of taxes or user fees to provide disincentives to entry into the fishery. A third approach suggested is the use of fisherman quotas. Each fisherman would receive a license entitling him to catch a certain share of the total yield from the stock of a fishery. Within certain conservation

Field 6—WATER RESOURCES PLANNING

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constraints the quota holders should be free to use any kind of vessel, gear or technique desired. Problems of allocation of quotas, penalties for exceeding quotas and administrative procedures are discussed. Advantages and disadvantages are evaluated against assumed goals for the management of fisheries. (Comfort-Florida)
W74-03991

FLOOD DAMAGE PREVENTION-CONSTRUCTION OF BUILDINGS,

III Pub Acts (1973) ch 78-400, sec 1 to 5, to be codified as, III Stat, ch 85, sec 1711 to 1715.

Descriptors: *Flood protection, *Flood control, *Runoff, *Regulation, *Illinois, Rain, Snowmelt, Construction, Permits, Buildings, Legislation, Cities, Local governments, State governments, Flooding.

Identifiers: Water runoff.

Power is granted to municipalities to adopt ordinances which state requirements for building permit applications. The municipality is allowed to require building permit applications to contain a statement that such buildings and appurtenances connected therewith include facilities for the orderly runoff or retention of rain and melting snow. The ordinance can include a requirement that a licensed civil engineer sign a statement certifying that the plans include facilities adequate to prevent harmful runoff. (Daniels-Florida)
W74-03992

LEASING OF AREAS FOR CULTIVATION OF MARINE RESOURCES.

Me Rev Stat Ann, Ch 414, tit 12, sec 3721-3731 (Supp 72-73).

Descriptors: *Marine fisheries, *Aquatic life, *Coasts, *Maine, *Leases, Coastal plains, Shellfish, Legislation, Marine biology, Marine fish, Commercial shellfish, Shellfish farming, Contracts, Exploitation, Rent.

Identifiers: Marine resources, Coastal waters.

Leasing provisions are established for areas of Maine coastal waters for the cultivation of marine resources. The Commissioner of Sea and Shore Fisheries can issue leases if not in conflict with the Marine Coastal Plan for the harvesting and cultivation of marine fish of shellfish. Provisions and guidelines are established as to application for the leases, notice, area to be marked, grievances, rights, and renewal and revocation. Holders of leases for cultivation of any species on flats or land under coastal waters are entitled to take all of that species in the specified leased area. Any person who interferes with the enjoyment of any lease is subject to fines or imprisonment. No person (or corporation) is entitled to a total lease area of more than 200 acres or lease term longer than 10 years. (Daniels-Florida)
W74-03993

PETRUS V. ARKANSAS IRRIGATION CO. (INJUNCTION TO PREVENT INTERFERENCE WITH FLOWAGE RIGHTS).

499 SW2d 60 (Ark 1973).

Descriptors: *Reservoir operation, *Arkansas, Judicial decision, *Legal aspects, *Irrigation water, Water supply, Water costs, Reservoir management, Easements, Irrigation canals, Levees, Damage, Agriculture, Impoundments, Riparian rights.

Identifiers: Injunctive relief, Flowage rights.

For thirty years the plaintiff, an irrigation company, had maintained a six-thousand acre reservoir. The company used water from the reservoir in its own farming operations, and sold water to neighboring rice farmers. The company did not own the entire lakebed, but it had flowage rights

upon lands lying below 207 feet mean sea level. The defendants owned land subject to the irrigation company's flowage easements. The defendants constructed levees to enclose twenty acres of their land subject to the flowage rights and installed a pump enabling them to withdraw water from the reservoir. In 1964, the plaintiff sued to require removal of the levees and the pump, and for compensation for water pumped from the reservoir. The plaintiff prevailed. On appeal, the Supreme Court of Arkansas concerned itself with the actual or apparent authority of an agent of the plaintiff to enter into a contract with the defendant. This court affirmed the decision of the lower court, but remanded the question of damages. This question pertained to the fair rental value of the twenty acres, and the value of the water consumed. (Sperling-Florida)
W74-03994

HILLSBOROUGH COUNTY ENVIRONMENTAL PROTECTION COMMISSION V. FRANDORSON PROPERTIES (DELIBERATE DESTRUCTION OF MANGROVES IN TIDAL WATERS NOT FORBIDDEN).

283 So 2d 65 (2nd DCA Fla 1973). 4 p.

Descriptors: *Florida, *Water pollution control, *Tidal waters, *Mangrove swamps, *Judicial decisions, Water pollution, Legislation, Pollution abatement, Legal aspects, Water law, Conservation, Shores.

Plaintiff sought to prevent defendant property developer's deliberate destruction of mangroves growing in tidal waters. The applicable statute prescribed water pollution in terms of depositing or permitting foreign substances to be discharged into waters. Plaintiff contended that the admitted mangrove destruction amounted to water pollution because of the loss of organic materials which had been produced by and were intimately associated with the living mangroves and had resulted in a deterioration of the ecological quality of the waters involved. The District Court of Appeal of Florida agreed that the destruction of the mangroves had caused severe ecological effects on the tidal waters, and stated that the Legislature possessed the power to forbid such destruction. The Court concluded, however, that this legislative provision was an attempt to define and prevent water pollution in terms of depositing or permitting foreign substances to be discharged into the waters, and that a fair reading would not permit the interpretation that it was enacted to forbid the destruction or removal of organic or inorganic materials already present in the water. (Ritchie-Florida)
W74-03996

SCHWERMANN V. REINHART (DRAINAGE DITCH CONSTRUCTION IN WILDLIFE CONSERVATION AREA).

210 NW 2d 33-37 (Minn 1973) 5 p.

Descriptors: *Judicial decision, *Drainage practices, *Drainage effects, *Ditches, *Marshes, Habitats, Cultivation, Drainage area, Drainage, *Minnesota, Legal aspects, Drainage system, Legal review, Ducks(Wild), Government, Wildlife conservation, Conservation, Public benefit.

Identifiers: Crop stabilization.

The petitioner, having secured the establishment of a drainage ditch by order of the county board, appealed from a Minnesota District Court's order overruling the board's order. The ditch would drain approximately 2,700 acres of which 100 acres are marshland which provide habitat and nesting areas for wild ducks. The lower court found that the marshy areas were a significant part of the wildlife-production area, that the addition of tillable land was irreconcilable with the federally financed crop-stabilization program, and that a large part of the flow from this area would be

added to the flow of the Minnesota River. Considering these factors the trial court found the proposed ditch would be of no public benefit or utility. The Supreme Court of Minnesota reversed the decision and remanded. The Supreme Court found that the trial court abused its discretion in relying on the conservation issue in disallowing the establishment of the drainage ditch. (Gragg-Florida)
W74-03997

SOIL CONSERVATION DISTRICTS.

Tenn Code Ann, sec 43-1518 through 43-1519 (1955).

Descriptors: *Tennessee, *Legislation, *Water law, *Soil conservation, *Erosion control, Land conservation, Land use, Land management, Land development, Cultivation, Drainage, Flood control, Watersheds, Farm management, Engineering, Erosion, Planting management.

Establishment is authorized of soil conservation districts with the power to conduct surveys, investigations and research relating to soil erosion and prevention and the control measures needed. The district also has the power to have these findings demonstrated and published, and to have the measures carried out within the district. The district may enter into agreements to carry out erosion control and prevention operations, to acquire property and maintain, administer and improve such property, and to make agricultural and engineering equipment, fertilizer, seeds and seedlings available to assist landowners in carrying out conservation of soil resources and for the prevention and control of soil erosion. The district shall formulate land-use regulations necessary to fulfill the purposes of this act, but must submit these to the district in a referendum. These projects may also include construction of terraces, check dams and like structures, the observance of particular cultivation methods, and specific cropping programs and tillage practices as well as retiring from cultivation highly erosive areas. (Silber-Florida)
W74-03998

SUPERVISION OF DAMS AND RESERVOIRS.

Conn Gen Stat Ann, sec 25-110, 25-112 (Supp 1972), as amended, act 73-571, sec 7, 8 (1973) Pub Acts of Conn.

Descriptors: *Connecticut, *Wetlands, *Dams, *Reservoirs, *Environmental effects, Legislation, Permits, Environment, Inland waterways, Construction, Watersheds(Basins), Dam construction, Dam design, Foundations investigations.

The Connecticut commissioner of environmental protection is authorized to enter upon private property to make investigations of dams, watersheds, sites and structures as may be necessary, for inspection of the design and construction of these structures. He is also empowered to gather data on the environmental impact of these structures on the inland wetlands of Connecticut. Before any such structure can be constructed, altered, added to, replaced or removed, the person or firm undertaking the work must apply to the commissioner for a permit. Plans, specifications and other data must be submitted to the commissioner, and upon his determination of the environmental impact upon the inland wetlands, he will issue a permit authorizing the proposed construction work under the conditions necessary to further the purposes of this act. (Ritchie-Florida)
W74-03999

INTERSTATE COMPACTS AND REGIONAL WATER RESOURCES PLANNING AND MANAGEMENT,

J.C. Muys.

Natural Resources Law, Vol 6, p 153-188, 1973. 99 ref, 5 append.

WATER RESOURCES PLANNING—Field 6

Water Law and Institutions—Group 6E

Descriptors: *Interstate compacts, *Interstate commissions, *Delaware River Basin Commission, *River basin commissions, *Institutions, Organizations, Interstate, Water resources development, Interstate rivers, Water law, Governments, Colorado River Compact, Equitable apportionment, Water policy, Administrative agencies, Management, Political aspects.

A survey is presented of the use of compact approach to contend with interstate water problems with suggestions for legislative action designed to facilitate the use of the compact mechanism in regional water resources management. A historical background on the use of compacts, and an analysis of four different categories of compacts, leads to an evaluative discussion of the viability of comprehensive, regulatory and project development federal-interstate compacts. A detailed look at the Delaware River Basin Compact is the basis of optimism on the potential of the compact device, while the shortcomings of other compact efforts also are described. The compact mechanism affords the optimum permanent institutional approach to regional water problem. Specific recommendations for the Congress include: (1) advance consent should be granted to a limited class of compacts; (2) minimal conditions for future consent to all water compacts should be specified; (3) endorsement of the federal-interstate compact; (4) a statement of the relative roles of existing state and federal agencies with respect to interstate compact commissions; (5) supervision of, and cooperation with federal compact negotiators; (6) granting to federal district courts jurisdiction over all water compact matters. (Perrey-Florida)
W74-04000

KENTUCKY POLLUTION ABATEMENT AUTHORITY.

Ken Rev Stat Ann, sec 224A.010, 224A.020 (Supp 1973).

Descriptors: *Kentucky, *Grants, *Government finance, *Water pollution, Treatment, *Treatment facilities, *Water resources, Water treatment, Treatment, Sewage treatment, Water quality, Water supply, Legislation, Environmental effects, Pollution abatement, Water quality control, Water quality act.

Section 224A.010 lists and defines terms as used in chapter 224A of the Kentucky and enumerates its responsibilities and powers. The Kentucky legislature's findings of fact in regard to water pollution are set out in section 224A.020. Recognizing that the state's water resources are being injured by pollution, the legislature considers it essential for the state to actively engage in a program of assistance to governmental agencies to provide waste water treatment facilities. Additionally, the general assembly of Kentucky finds that in order to impose the minimum financial burden on its citizens, it must provide state aid to the construction and expansion of water treatment works in order to make use of federal grants-in-aid for that purpose. (Comfort-Florida)
W74-04002

SOIL AND WATER CONSERVATION COMMISSION: POWERS OF SUPERVISORS.

Ohio Rev Code Ann, sec 1515.08 (Supp 1972).

Descriptors: *Ohio, *Flood damage, *Flood protection, Water pollution control, Legislation, Water pollution, Pollution abatement, Regulation, Conservation, Permits, Construction, Environmental effects, Administrative agencies, Administration, Governments, Drainage systems, Damages, Flood control, Water resources planning act, Comprehensive planning, Water policy, State governments, Resources, Planning, Watershed management.

The supervisor of an Ohio water conservation district has the power to conduct surveys, investiga-

tions, and research of floodwater damage, preventive and control measures, and works of improvement of flood prevention. These may also be related to the conservation, development, utilization, and disposal of water needed within the district. The supervisor also has the power to develop, implement, construct, repair, and maintain works of improvement for flood prevention and disposal of water within the district. Supervisors are also involved in the funding of agricultural pollution and sediment pollution abatement. Supervisors must approve or disapprove all projects to be undertaken. The supervisor of a water conservation district submits annually to the division of water districts a work plan of any projects it plans to commence. The director of natural resources reviews and approves, disapproves, or makes recommendations on those projects having substantial environmental impact on the waters of two or more counties or states. Projects will be disapproved only if they adversely affect the environment, without equal or greater benefit to the public. (Sperrey-Florida)
W74-04003

DEPARTMENT OF NATURAL RESOURCES--WATER RESOURCE.

Wis Stat Ann, sec 144.025 (1973).

Descriptors: *Legislation, *Water quality control, *Water resource planning, *Waste-water treatment, *Wisconsin, Water law, Administration, Natural resources, Planning, Long-term planning, Future planning, Water utilization, Water pollution control, Water pollution abatement, State governments.

The Wisconsin Department of Natural Resources shall serve as the state's central unit to protect, maintain and improve the quality and management of the waters of the state, ground and surface, public and private. It shall design a comprehensive action program directed at all present and potential sources of water pollution. The Department shall formulate a comprehensive state water resources plan for each region, which shall be reviewed and projected every two years with a report to the governor. The Department shall adopt rules setting water quality standards for the state to protect the public interest. The authority of the Department shall extend to waste treatment operations, well drilling on private property, chemical treatment of waters, interstate anti-pollution programs and emergency orders. Hearings shall be provided for those interested, whenever possible. The Department may abate public nuisances, prohibit the installation of septic tanks in areas where their use would impair water quality and insure compliance of its lawful orders. There shall be a regional water resources board for each region which shall advise the Department on the regional water quality and pollution status. (Silber-Florida)
W74-04005

PLANNING AND ZONING-LAND SUBDIVISIONS.

Me Rev Stat Ann CH 14, Tit 30, sec 4956 (Supp 1973).

Descriptors: *Land use, *Water pollution, *Legislation, *Maine, *Planning, Sewage disposal, Soil erosion, Soil management, Discharges, Soil water movement, Regulation, Administration, Local governments, City planning, Water resources development. Identifiers: Subdivisions.

Power to adopt subdivision regulations is vested in the various municipalities. However certain guidelines must be considered when regulations are promulgated and before approval is granted for a proposed subdivision. A determination must be made that the subdivision will not result in undue water pollution. In making this determination consideration must be given the elevation of land

above sea level and its relation to the flood plains. The slope of the land and its effect on effluents and the availability of an adequate water supply must also be considered. Additionally all facets of waste disposal must be considered. (Daniels-Florida)
W74-04006

FRIENDS OF THE EARTH V. ARMSTRONG (ENVIRONMENTAL PROTECTION SUIT).

485 F 2d 1 (10th Cir 1973). 16 p.

Descriptors: *Environmental effects, *Reservoir releases, *National monuments, *U.S. laws and statutes, *Judicial decisions, Impounded waters, Environmental control, Reservoir operations, Water level fluctuations, Flow control, Economics, Electric power costs, Economic impact, Economic justification, Public lands, Public rights, Legal aspects, Constitutional law. Identifiers: *Injunction.

The plaintiffs, non-profit environmental corporations and the head of a corporation which conducted river tours for profit, brought action for mandamus to have defendants take such action as would be necessary to prevent water being impounded in Lake Powell from spreading into any part of Rainbow Bridge National Monument. The Colorado River Storage Project Act of 1956 prohibited any water from Lake Powell entering any section of the national monument. Subsequent to the passage of this act, Congress denied budgetary requests for protective works with respect to Rainbow Bridge and specifically directed a prohibition against the use of money for such purposes. The defendants contended that the subsequent acts constituted Congress' implied repeal of the applicable sections of the Storage Project Act. The United States Circuit Court of Appeals overturned a lower court decision in favor of the plaintiffs and remanded the case basing its decision upon statutory construction and economic policy determinations based on the necessity of supplying electrical power. In its judgment, the court explained that the water depth under the bridge should not threaten its structure, but in acknowledging the possibility of unexpected damage, it would retain jurisdiction for ten years to allow future relief if necessary. (Proctor-Florida)
W74-04007

UNITED STATES V. TOBIN PACKING CO. (VIOLATION OF RIVERS AND HARBORS ACT).

362 F Supp 1127-1131 (ND NY 1973). 5 p.

Descriptors: *Rivers and Harbors Act, *Waste discharge, *Water quality, *Refuse, *Judicial decisions, Water Quality Act, Navigable waters, Waste disposal, Pollutants, Water pollution sources, Water law, Legal aspects, Pollution abatement, Water pollution control, Industrial wastes, Law enforcement, Penalties(Legal). Identifiers: Estoppel.

The United States charged the defendant, a packing company, with fifty counts of violation of Section B of the Rivers and Harbors Act of 1899. The indictment consisted of the general accusation that the defendant caused refuse to be discharged into a tributary of navigable waters of the United States. The defendant moved to dismiss the indictment as insufficient or in the alternative to dismiss forty-nine of the asserted counts. After denying the motion to dismiss based upon insufficiency, the United States District Court in assessing the validity of the counts, explained that the approach of the act is not aimed at the polluting substance per se but at the acts of the polluter. The statute is meant to punish each separate act of discharging refuse. To sustain each count, the plaintiff must prove that each refers to some act which constituted a discharge on the dates listed. The court

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asserted that a good faith attempt to meet the water quality standards imposed by the Water Quality Acts would not absolve liability under the Rivers and Harbors Act. It acknowledged, however, that the defendant could assert as a defense the fact that it had been misled by governmental agencies as to its discharging activities. (Proctor-Florida)
W74-04008

OHIO V. CALLAWAY (INJUNCTION ACTION FOR FAILURE TO COMPLY WITH NEPA).
364 F Supp 296-302 (SD Ohio, 1973). 7 p.

Descriptors: *Ohio, *Utilities, *Reservoir construction, *Impounded waters, *Water control, Water utilization, Impoundments, Reservoir sites, Surface waters, Water sources, Dams, Spillways, Flood control, Environmental effects, Reservoirs. Identifiers: *Environmental Impact Statements, *National Environmental Policy Act of 1969, Injunction relief, Public trust doctrine.

Plaintiff-state of Ohio sought to protect the public trust by seeking a preliminary injunction to enjoin the Secretary of the Army and other federal officials from executing additional contracts on a proposed and partially completed construction of reservoirs in the Ohio Valley. In addition state of Ohio sought to enjoin clear-cutting, removal of ground cover, or any other construction activity altering the natural environmental of the project area. The two reservoir projects had been funded, three contracts had been executed, and work was in progress to convert free flowing streams into impounding lakes behind spillways. The Army Corps of Engineers filed Environmental Impact Statements on the projects as required by the National Environmental Policy (NEPA). Defendant-Secretary of the Army admitted that the statements filed were below the 1973 standards for such statements. The United States District Court held that all federal agencies were obligated to comply with NEPA by preparing adequate environmental impact statements. The Court issued a preliminary injunction for the eight week remainder of the construction season, but allowed the three contracts already executed and in progress to continue to avoid penalizing the contractors. (Perrey-Florida)
W74-04009

UNITED STATES V. CANNON (INJUNCTION AGAINST VIOLATION OF RIVERS AND HARBORS ACT).
363 F Supp 1045-1052 (DC Delaware 1973). 8 p.

Descriptors: *Rivers and Harbors Act, *Wetlands, *Tidal marshes, *Landfills, Environmental engineering, Land development, Federal jurisdiction, Bulkhead line, Navigable waters, Riparian rights, Ownership of beds, Legal aspects, Permits. Identifiers: Mean high tide mark, Injunction.

The U.S. government sought to enjoin defendants' filling of certain tidal marshes on land owned by the defendants which extends into a bay. Defendants did not obtain a permit to fill which the government contended was a violation of the Rivers and Harbors Act. The government contended that its jurisdiction extends beyond the mean high water mark to all portions of a tidal marsh adjacent to navigable water, including those portions which are not inundated at mean high tide. Defendants insisted that even those marsh areas covered by waters of a navigable bay at mean high tide are not navigable waters of the United States unless they are navigable in fact. In disposing of the government's motion for summary judgement, the court ruled that the government's jurisdiction in the water in question extends to its mean high water mark and not to areas above the mark which are occasionally inundated by the bay. Because of the material dispute of fact involved in the case, the court refused to issue

summary judgment for the government. (Flowers-Florida)
W74-04010

UNITED STATES V. UNITED STATES STEEL (REFUSE ACT VIOLATION).
482 F. 2d 439 (7th Cir. 1973). 16p.

Descriptors: *Pollution abatement, *Rivers and Harbors Act, *Navigable waters, *Discharge, *Industrial wastes, Sewage, Oil wastes, Water pollution sources, Outflow, Wastes, Legislation, Legal aspects, Water pollution, Judicial decisions, Penalties(Legal), Water law.

Identifiers: Water Pollution Control Act 1948, Refuse Act of 1899, Water Quality Act of 1965.

Defendant was convicted of violation of the Refuse Act of 1899 for discharging refuse into the Calumet River. The act makes the discharging into navigable waters of any refuse matter of any description whatsoever without the permission of the Secretary of the Army a crime. Defendant's main contention was that the act requires an effect on navigation before permission is needed to discharge refuse and that the Secretary cannot decline to issue a permit for ecological reasons alone. The government made no attempt to show an effect on navigation. In upholding the conviction, the Seventh Circuit Court of Appeals noted that the words of the statute do not impose any limitation of an effect on navigation or a tendency to affect navigation on the refuse matter covered. Legislative history does not show that the statute means anything other than what it says. Discharge of any refuse matter, regardless of any apparent effect on navigation, is prohibited in the absence of a permit even if Congress thought at the time of enactment that permits would not, or could not be withheld on grounds that the material discharged was merely a pollutant. (Flowers-Florida)
W74-04011

CHICAGO AND NORTH WESTERN RAILWAY COMPANY V. TYLER (DAMAGE ACTION CAUSED BY FLOODING WATERS).
482 F. 2d 1007-1011 (8th Cir. 1973). 5p.

Descriptors: *Dam failure, *Disasters, *Flood damage, *Act of God, Judicial decisions, Legal aspects, South Dakota, damages, Floodings, Water law, Structures, Concrete dams, Transportation, Storms, Dams.

The action stems from the damage of several railroad cars derailed from extreme flooding of the tracks after a heavy rainfall and the collapsing of a nearby conservation dam. The plaintiff railroad company advanced three theories for damage recovery: negligence, strict liability and 'absolute nuisance.' The defendant denied strict liability pursuant to state law, and his own negligence and advanced contributory negligence and argued that an Act of God was solely responsible. The District Court found for the defendant, and the plaintiff appealed to the United States Circuit Court which affirmed. The Circuit Court found all instructions on the pleas advanced were correct and from the facts presented there was no clearly erroneous cause shown for reversal. As the conservation dam was common in use and appropriate in setting in the locale, both the strict liability and 'absolute nuisance' were unfounded theories for recovery. An as the facts showed the rainfall to be extremely heavy for the time and area, and as there was widespread flooding from various sources, not only the dam, the Act of God defense was clearly applicable. The Circuit Court also advanced the opinion, in dicta, that the jury verdict could possibly have been due to a finding of negligence on the railroad's part in operating its trains. (Sutton-Florida)
W74-04012

CONSERVATION, GEOLOGY AND WATER RESOURCES,
Fla. Stat., sec. 373.011 through 373.241 (1971).

Descriptors: *Florida, *Saline water intrusion, *Water conservation, *Water resources development, Water supply, competing uses, Water demand, Water sources, Artificial recharge, Confined water, encroachment, Mineral water, Channel improvement, Administrative agencies, Public health, Environmental effects, Legislation, Water resources planning act, Groundwater resources, subsurface waters, Water quality, Water utilization, Administration, Resources.

These statutes concern the Florida Division of Interior Resources, its powers and functions. The division has the power to requisition needed monies from the treasurer. The duties of the division include a report of the state. The report must contain a full description of such surveys and exploration, occurrences and location of mineral deposits, surface and subterranean water supply, mineral waters, and the best and most economical method of development. There are also certain procedures to be followed when dealing with artesian wells such as capping. The Water Resources Law declares the policy of the state to be the maintenance, protection, and conservation of the water resources of the state. To implement this goal the division is given power to capture, store, and regulate the use of water resources as well as supervise local water regulatory districts. This power is exercised in accordance with notice and hearing requirements and is subject to judicial review. (Sperling-Florida)
W74-04013

DRAINAGE.

Fla. Stat. Ann., sec. 298.01, 298.02, 298.03, 298.07, 298.08, 298.09, 298.11, 298.15, 298.16, 298.17, 298.22 (Supp. 1973).

Descriptors: *Florida, *Drainage systems, *Flood control, *Flow augmentation, Water distribution(Applied), Public health, Dikes, Legislation, Standards, Regulation, Watershed management, Conservation, Natural resources, Construction, Administrative agencies, Administration, State governments, Levees, Dams, Water management.

To form a water-management district, the Florida department of natural resources, or a majority of the owners of the lands in the district may make and sign a petition which should contain the name of the district, the proposed life of the district, the boundary line of the proposed district, the names of owners of lands in the district and contiguous to it, the feasibility of a special assessment procedure, and that the proposed district is in the public interest. Public notice of the petition and a hearing for objections to the formation of the district are required. Also, by petition to the court and with a hearing for objections, districts may be consolidated or the life of districts extended. Supervisors in each district are elected by the landowners in each district, and the department of natural resources may vote, to the extent they have property in the district. The supervisors of each district will keep a record of the meetings, appoint a chief engineer and treasurer, and fix compensation for employees. The supervisors are given broad powers to effect the drainage, protection, and reclamation of the land in district. (Sperling-Florida)
W74-04014

WATER POLLUTION CONTROL.
Vt. Stat. Ann., Title 10, sec. 910-920. (1970)

Descriptors: *Vermont, *Legislation, *Water law, *Sewage, *Sewage disposal, *Sewage treatment, *Waste water disposal, Water pollution sources, Waste treatment, Water pollution control, Abatement, Industrial wastes, Municipal wastes, Waste

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disposal, Environmental sanitation, Waste water treatment, Permits, Water quality, Water quality standards.

Any person who is discharging treated or untreated wastes into waters of the state shall file a written report of such discharges with the Vermont Water Resources Department together with an application for a discharge permit. If the department finds that the discharge will reduce the quality of the receiving waters below the standards established it shall not issue a permit. A discharge permit shall state the manner and frequency of permissible discharges, any required pollution abatement facility necessary in the treatment or processing of the waste and any additional conditions necessary to preserve and protect the receiving water's quality. When an applicant does not qualify for a discharge permit, the department may issue a temporary pollution permit. This permit shall be valid only for the time necessary to place into operation a facility or system which will qualify for a discharge permit. The department may revoke any permit upon findings of violation of any conditions or standards of the permit issued. The authority of the department extends to the operation and regulations of municipal sewage treatment plants. (Silber-Florida)
W74-04015

CONSERVATION--REGULATION OF STREAM-FLOW.

Vt. Stat. Ann., Title 10, sec. 651-654. (1970)

Descriptors: *Water law, *Legislation, *Stream flow, *Stream flow regulations, *Stream flow alternation, *Dams, Diversion, Water management, Water resources development, Diversion structures, Flood control, Riparian rights, Administration, Coordination, Maintenance, Water policy, Vermont, Water, Flow, Streams, Structures.
W74-04018

The Vermont water resources board (board) is responsible for the proper administration of the water resources of the state. This requires careful consideration of the interruption of the natural flow of water resulting from construction and operation of dams and other control structures. Corrective actions shall be taken to assure continuous flow of waters in the natural water courses consistent with riparian rights. Whenever the board determines that the maintenance of some artificial restriction of streamflow threatens the public interest or welfare, it may recommend that action be taken by the person owning the dam to release the water considered necessary and proper in the public interest. The board shall be the state's agent in coordinating the state's interest before the federal power commission in all matters involving regulation or control of natural stream flow through the use of dams situated on streams within the boundaries of the state. (Silber-Florida)
W74-04016

LITTERING OF PROPERTY AND WATERS.

Mich. Comp. Laws Ann., sec. 752.901, 752.903 (1967), as amended, act 54, sec. 1 (1973) Mich. Pub. Acts.

Descriptors: *Michigan, *Water pollution control, *Environmental sanitation, *Litter, Legislation, Water pollution sources, State governments, Pollution abatement, Pollutants, Water quality control, Regulations, Aesthetics, Wastes.
Identifiers: *Water pollution(Litter).

In the state of Michigan it is illegal, without the approval of some public authority, to dump, deposit, place, throw or leave, or cause or permit the dumping deposition of litter on any waters. Waters includes, but is not limited to, any body of water, watercourse, shores or beaches, as well as the ice above such water. The penalty that can be imposed for this misdemeanor includes, in lieu of sentence, the imposition of litter-gathering labor.

There is a maximum fine of \$400.00 plus costs, and the maximum jail term is ninety days. (Sperling-Florida)
W74-04017

SUPERVISION OF OIL, GAS, AND NATURAL DRY GAS WELLS.

Mich Comp Laws Ann., sec 319.2, 319.3, 319.6, 319.18a, 319.18b (Supp 1973), as amended, act 61, sec 1, (1973) Mich Pub Acts.

Descriptors: *Michigan, *Well permits, *Well regulations, *Legislation, *Water pollution control, Wastewater, Drilling, State governments, Oil wells, Brine disposal, Gasoline, Natural gas, Oil pollution, Oil wastes, Water pollution, Water pollution sources.

Under section 319.3 the director of the Michigan department of natural resources is given the power to act as the supervisor of wells. Under section 319.6, the supervisor is empowered to prevent waste occurring in connection with the drilling process. He is specifically empowered to require drillers to conduct their operations so as to prevent escape of water into oil or gas strata; to prevent pollution, damage to or destruction of fresh water supplies including lakes and streams and the Great Lakes and connecting waters; and to require the disposal of salt water and brines and oily wastes in such a manner that no unnecessary damage is done to surface or underground resources. In addition, when an operator is found to be in violation of any rules enacted under these statutes, compliance can be forced and any resultant costs charged to the owner. (Flowers-Florida)
W74-04018

EMINENT DOMAIN.

Fla. Stat., sec. 361.04 (1971).

Descriptors: *Legislation, *Statute, *Eminent domain, *Adjacent landowners, *Water supply, Condemnation, Legal aspects, Dependable supply, Potential water supply, Lakes, Ponds, Administration, Florida, Water supply development, Water pollution, Surface waters, Subsurface waters.

The power of eminent domain is given to water works companies organized under the general or special laws of the state of Florida. If necessary to its contemplated business of supplying water a water works company may enter upon and appropriate to its use any land, public or private, provided that the company makes due compensation according to law to private owners. A duly organized water works company may also take from land convenient to its works any materials necessary for constructing, operating, keeping in repair or preserving such works upon making due compensation. If any part of the company's supply of water is derived from any lake, pond, or stream, whether surface or subterranean, it may appropriate any land lying contiguous to the body of water necessary to preserve or protect the water from diversion or contamination upon making the specified compensation. (Sutton-Florida)
W74-04020

CZARNICK V. LOUP RIVER PUBLIC POWER DISTRICT (LIABILITY OF POWER DISTRICT FOR DAMAGE RESULTING FROM NEGLIGENCE).

209 N.W.2d 595-600 (Nebraska 1973). 6 p.

Descriptors: *Judicial decision, *Diversion, *Alteration of flow, *Flood damage, *Nebraska, Channels, Flooding, Legal aspects, Erosion, Diversion structure, Dikes, Excavation, Water law, Governments, Easements, Penalties, Soil erosion, Rivers.

The plaintiff landowner brought action for damages and injunctive relief with respect to flooding of his farmland. The action was brought against the Loup River Power District which had granted an easement to the state of Nebraska. The state of Nebraska was also joined as a defendant for constructing upon said easement a channel cut which diverted the course of the Loup River which in turn caused the flooding of plaintiff's land. The Supreme Court of Nebraska dismissed the action against the Power District because the plaintiff failed to prove negligence in the Power District's grant of the easement. The court also dismissed the damage claim against the state because the statute of limitations had expired. The court remanded for consideration the question of the injunction, finding that plaintiff's complaint alleged sufficient facts in support of his request for equitable relief. The court found that injunctive relief was not barred by the statute of limitations. (Gragg-Florida)
W74-04021

JURISDICTIONAL PROBLEMS CREATED BY ARTIFICIAL ISLANDS.

San Diego Law Review, Vol 10, No 3, p 638-663, May 1973. 138 ref.

Descriptors: *International waters, *Law of the sea, *Engineering geology, Foreign waters, Electric power production, Airports, Political aspects, Boundaries(Property), State jurisdiction, Continental shelf, Water resources, Federal jurisdiction, Foreign countries, International law, Beds under water, Legal aspects.

Identifiers: *Artificial islands, *Territorial waters, *Contiguous zone, Legal vacuum, Coastal states.

The need and ability to make artificial islands are discussed. Past attempts at the creation and maintenance of artificial islands are described. The creation of artificial islands has been proposed for a variety of purposes including cities, atomic power plants, superports, and jettorts. A review of United States law relevant to artificial islands is made but is limited to artificial islands which are used for exploiting the natural resources of the continental shelf. One difficulty is the lack of consensus between coastal states' claims to their territorial sea boundary. The possible exercises of jurisdiction over artificial islands in international waters, and the customary freedom of the high seas are discussed. This freedom has already been curtailed in the Convention on the Continental Shelf where coastal states are given exclusive jurisdiction over the shelf for the limited purpose of the exploitation of natural resources. Basing jurisdiction over artificial islands on existing concepts of international law is discussed. One such concept is the legal vacuum theory. A suggestion for dealing with artificial islands other than those on the continental shelf is the creation of an international regime. (Sperling-Florida)
W74-04022

A HARBINGER: THE SENKAKU ISLANDS.

San Diego Law Review, Vol 10, No 3, p 664-691, May 1973. 81 ref.

Descriptors: *Oil industry, *International waters, *Geology, *Law of the sea, *International law, Foreign waters, Foreign countries, Oil exploitation, Political aspects, Boundaries(Property), State jurisdiction, Legal aspects, Jurisdiction.

Identifiers: Coastal zone management, Coastal waters, International court.

Conflicting claims have been made on the Senkaku Islands following the discovery of oil. Involved are two questions, namely which state holds sovereignty over the islands and which state holds the right to the natural resources of the seabed in the vicinity of these islands. The discussion deals with solutions and alternatives to present law that could resolve the controversy and avoid future

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

conflicts. The Japanese and Chinese claims are discussed. Also discussed are the North Sea cases and proceedings in the International Court. The petroleum industry is also very interested in the outcome, but because of dissension the industry has never formulated much more than a laissez-faire attitude. President Nixon drafted a treaty reflecting principles in a United Nation's resolution proposing an international regime. The proposal, its weaknesses, and possible alternatives are described. (Sperling-Florida) W74-04023

THE FUTURE OF WATER QUALITY CONTROL,
For primary bibliographic entry see Field 5G.
W74-04026

OFFENSES CONCERNING PUBLIC ROADS AND NAVIGABLE WATERS.
Fla. Stat. Ann., 861.02, 861.021, 861.03, 861.04, 861.05, 861.06 (Supp. 1972).

Descriptors: *Florida, *Legislation, *Statute, *Navigable waters, *Transportation, Obstruction to flow, Streamflow, Water law, Roads, Law enforcement, Legal aspects, Regulations, Administration, Pollution control, Dams, Bridges, Channels.

These statutes set penalties, both felonies and misdemeanors, for offenses which affect public roads and navigable waters. They deal with obstructing water courses with dams, bridges, and other such structures (section 861.02), and also by obstructing marked channels with traps and nets (section 861.021). Other statutes, also concerned with water obstructions, cover injuring dams (section 861.03), the placing of water hyacinths (section 861.04), obstruction by bridge construction (section 861.05), and obstructing harbors (section 861.06). (Sutton-Florida)
W74-04029

SAFE DRINKING WATER ACT OF 1972—S.3994.
For primary bibliographic entry see Field 5G.
W74-04030

HIGH SEAS INTERVENTION: PARAMETERS OF UNILATERAL ACTION,
R. P. Cundick.
San Diego Law Review, Vol 10, No 3, p 514-558, May 1973. 105 ref.

Descriptors: *Law of the Sea, *International law, *Oil pollution, *Legal aspects, Foreign waters, International waters, Oil industry, Water pollution sources, Water pollution effects, Shore protection, Oil spills, Water law, Coasts, Seashores. Identifiers: *Intervention.

Intervention is action taken against a vessel to prevent or mitigate damage to coastal interests, unaccompanied by a threat to the internal or external affairs of the flag state. There is a conflict between nations' interests in free shipping of vital goods and coastal nations' interests in keeping their coasts free from oil spills and their resultant consequences. An increased number of spills which have prompted both unilateral and multilateral action have shown the need for effective legal procedures. The situation is analyzed as it now exists under international law, and the justification for action on the high seas is also discussed. Two particular experiences are analyzed, one involving Great Britain and the Torrey-Canyon and the other, South Africa and the Liberian tanker Wafra. An International Oceans Policy is needed. The duty and responsibilities of intervention are emphasized. The International Law rule of reasonableness in action and reaction should be used. (Sperling-Florida)
W74-04031

THE OCEAN DUMPING CONVENTION—A HOPEFUL BEGINNING,
For primary bibliographic entry see Field 5G.
W74-04032

WATER COMMISSION ENDORSES USER PAY CONCEPT,
Arkansas Wildlife Federation, Inc., Dardanelle, K. Hampton.
Arkansas Out-of-Doors, Vol 2, No 8, p 2, 11, August 1973. 2 photo.

Descriptors: *Water resource planning, *Water conservation, *Water development, *Water rights, *Water control, Land use, Land management, Water quality control, Flood control, Riparian rights, Wildlife conservation, Payment, Cost repayment, Water utilization, Water supply.

In its final report the National Water Commission emphasized the need to protect the environment by coordinating land use and water planning functions. Among its recommendations were more efficient use of water in agriculture and industry, reduction of municipal and domestic waste, updating laws to successfully implement future water policies and controlled development, management and protection of water resources. The Commission recommends that identifiable beneficiaries of water programs and projects be required to pay the costs of developments which give them economic benefits. The report indicates that there is presently enough water to meet essential needs, but not enough to waste. The Commission feels that the emphasis on water development should shift to water preservation and quality control. One improvement thought immediately necessary is to establish procedures for recording and transferring water rights and a development of effective riparian and water use laws, especially in the eastern states. Also emphasized is the need for better flood control provisions, channelization of streams, and adequate safeguards against water pollution as well as insuring the conservation of fish and wildlife dependent upon water resources. (Silber-Florida)
W74-04036

DEVELOPMENTS IN WATER UTILITY LAW, 1972-1973, AMERICAN BAR ASSOCIATION REVIEW.
For primary bibliographic entry see Field 5G.
W74-04037

PAASCH V. BROWN (DAMAGES FROM OBSTRUCTION OF WATER FLOW BY LOWER LANDOWNER).
208 N.W. 2d 695-698, (Neb. 1973). 4 p.

Descriptors: *Nebraska, *Legal aspects, *Surface waters, *Obstruction to flow, Stream, River, Snowmelt, Rainfall, Diversion structures, Judicial decisions, Drainage, Drainage effects, Repulsion (Legal aspects), Relative rights. Identifiers: Injunction.

Plaintiff, upper landowner, brought suit for injunctive relief and damages against lower landowner who plaintiff contended had obstructed the flow of surface waters in a natural drainage way that was not a stream, river, brook or watercourse. The Supreme Court of Nebraska granted injunctive relief. The Court held that diffused surface waters, which result from rainfall and melting snow and have no permanent source of supply or regular course, may be dammed, diverted, or otherwise repelled by an adjoining landowner without liability, if it is necessary and done without negligence. However, when surface waters concentrate and gather in volume, so as to lose their character as diffused surface waters, and flow into a natural depression, draw, swale, or other natural drainway, the flow may not be arrested or interfered with to the injury of neighboring proprietors. (Sears-Florida)
W74-04039

IMPROVING WATER QUALITY MANAGEMENT PLANNING IN NONMETROPOLITAN AREAS.

National Area Development Inst. of Spindletop Research Inc., Lexington, Ky.
For primary bibliographic entry see Field 5G.
W74-04199

SOME ASPECTS OF THE THEORY OF EXPLOITATION OF FISH RESOURCES, (IN RUSSIAN).
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
For primary bibliographic entry see Field 8I.
W74-04278

6F. Nonstructural Alternatives

COMMUNITY WELL-BEING AS A FACTOR IN URBAN LAND USE PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6B.
W74-03751

AN EVALUATION OF URBAN FLOOD PLAINS,
J. E. Goddard.

Availability from NTIS as PB-227 337 \$3.25 in paper copy, \$1.45 in microfiche. American Society of Civil Engineers Urban Water Resources Research Program Technical Memorandum No 19, New York, NY, December, 1973, 40 p, 2 fig, 7 tab, 10 ref. OWRR C-4048(No 9009)(2). OWRR 14-31-0001-9009.

Descriptors: *Flood plains, *Urbanization, United States, *Land use, *Capital investment, *Flood damage, *Implied benefits, Federal project policy, Flood protection, Storm drains, *Cities, Evaluation.

Identifiers: National assessment, National sample, Flood plain occupancy, Flood control works, Integrated management.

Using 26 'Urban Areas' with populations ranging between 50-thousand and 7-million persons as a national sample, close to one-sixth of urban lands in the U.S. lie within natural 100-year flood plains, and slightly over one-half of such flood plains already have been developed. Average annual flood damages for urban areas may be about three-fifths of the national total. Slightly over half of the national investment in flood control works have been for the protection of urban areas. Information available does not permit estimation of implied benefits. In comparison, well over one-half of urban lands are served by systems of underground drainage that represent over four times the capital investment in flood plain protection and are associated with approximately the same level of average annual flood damages. Much of the floodplain flooding as well as the land-runoff water quality problem could possibly be more effectively countered on the land feeding urban watercourses, provided planning and development of drainage systems and flood plain management programs can be coordinated and integrated. Specific recommendations are made on acquisition of needed information. There are implications for emerging national water policies. (McPherson-ASCE)
W74-03756

6G. Ecologic Impact Of Water Development

COMMON PROPERTY, CONGESTION, AND ENVIRONMENTAL POLLUTION,
Wisconsin Univ., Madison. Dept. of Economics.
R. H. Haveman.
Quarterly Journal of Economics, Vol 87, No 2, p 278-287, 1973. 7 ref.

RESOURCES DATA—Field 7 Data Acquisition—Group 7B

Descriptors: *Welfare(Economics), *Environment, *Pollutants, *Graphical analysis, Economic efficiency, Real costs.

Identifiers: *Common property, Congestion, Environmental pollution, Externalities, Social costs.

Problems of congestion and pollution are typically lumped together under the title common property resource problems. While these problems have in common nonappropriability and inequality of marginal social costs and benefits at equilibrium the theoretical nature of resource misallocation in the pollution, congestion, and common property cases differ. In the common property case, excessive output is stimulated by the negative user costs which are generated by the existence of producers' quasi-rents, not appropriated under free entry. In the congestion case, overuse is encouraged because all crowding costs by users are not reflected in their marginal use decisions. In both cases, resource misallocation and welfare loss is limited, with resource use stopped before net economic welfare generated by the activity reaches zero. In the pollution case, the residual effects of the consumption or production activity are typically not borne by the producer. Pollution costs do not enter into the consumption or production decision of the producer at all, leaving the equilibrium output level the same, with or without the pollution. As a result, the net economic surplus of the activity may be negative in the pollution case, a result not possible under the other two. (Schroeder-Wisconsin)

W74-03958

THE POLLUTION SUB-SYSTEM,

P. K. Marstrand, and T. C. Sinclair.
Futures, Vol 5, No 1, p 80-89, 1973. 1 fig, 13 ref.

Descriptors: *Forecasting, *Systems analysis, Analytical techniques, Methodology, *Model studies, Absorption.

Identifiers: World 3 pollution subsystem, *Pollution effects.

The World 3 pollution subsystem has drawn increasing public attention. The model predicts that pollution grows at the same rate as industrial and agricultural output, resulting over time in a catastrophe. Because the model is based on limited data, it may reflect preconceptions which distort its results. The model's assumptions and their effects are examined. The model assumes pollution entering the biosphere over time arises from industrial or agricultural activities. The higher the level of pollution, the greater the absorption rate. Conversely, the rising level lengthens the absorption time, depressing the rate. This dynamic behavior is invalid for some pollutants which might enter the biosphere immediately or which may have differing effects on the absorption rate. Also dubious were the assumptions that pollution absorption and generation were equal in 1900 and that the maximum upper pollution limits would occur when levels reached 25 times that of 1970. More disturbing are the model's dismissal of the effects of consumer activities, its assumption that pollutants are evenly distributed over space, and its failure to account for possible technical change. The model, with its predictions of catastrophe, may do a disservice by shifting attention away from solvable local problems. (Schroeder-Wisconsin)

W74-03964

TEMPORARY NAVIGATION LOCK (MODIFICATION OF LOCK AND DAM 53) (FINAL ENVIRONMENTAL IMPACT STATEMENT), OHIO RIVER, ILLINOIS AND KENTUCKY.

Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 8A.
W74-03966

CLEANING UP A RIVER,

For primary bibliographic entry see Field 5G.

W74-03968

OAKLAND INNER HARBOR, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 8A.
W74-04027

ESTUARIES UNDER ATTACK,

Oregon State Univ. Extension Service, Corvallis, Marine Advisory Program.
W. Q. Wick.

Water Spectrum, Vol 5, No 3, p 12-18, 1973. 6 p, 4 photo.

Descriptors: *Aquatic habitats, *Saline water, *Estuarine environment, *Estuaries, *Ecology, Oil industry, Commercial fishing, Mixing, Environmental control, Estuarine fisheries, Encroachment, Bays, Oceans, Oregon, Gulfs, Aquatic environment, Intertidal areas, Saline water-freshwater interfaces, Sea water.

The value conflict over estuaries is discussed. The conflict is between the environmentalist on one hand and the industrialist on the other. A mutual compromise from both sides is supported. Both the ecological need to preserve the estuary and man's need to eat and progress are emphasized. Human needs are outlined and ecological desires are stressed. Five qualities crucial to the biological productivity of estuaries are suggested. A dynamic process centered around getting the citizens of the community deeply involved in all stages of planning and operation is proposed. The Estuary Planning Guidelines put out in 1973 by the Oregon Coastal Conservation and Development Commission are one way of gaining community support. The Coastal Zone Management Act could provide Federal impetus and support to the conflict. A positive approach is emphasized with community support in land and water use plans, zoning ordinances and sample development projects. However the urgency of action now is stressed. (Sutton-Florida)

W74-04033

THE ENVIRONMENTAL COST OF ECONOMIC GROWTH,

Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.

For primary bibliographic entry see Field 5G.

W74-04088

7. RESOURCES DATA

7A. Network Design

THE DESIGN OF THE MONITORING SYSTEM FOR THE THERMAL EFFECT STUDY OF THE SURRY NUCLEAR POWER PLANT ON THE JAMES RIVER,

Virginia Inst. of Marine Science, Gloucester Point.

For primary bibliographic entry see Field 5B.

W74-04246

7B. Data Acquisition

INTEGRATED MEASUREMENT OF SOIL MOISTURE BY USE OF RADIO WAVES,

Utah State Univ., Logan. Coll. of Engineering.

For primary bibliographic entry see Field 2C.

W74-03772

EVALUATION OF WATER FLUX ABOVE A DEEP WATER TABLE USING THERMOCOUPLE PSYCHROMETERS,

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

For primary bibliographic entry see Field 2G.

W74-03776

VACUUM EXTRACTORS TO ASSESS DEEP PERCOLATION LOSSES AND CHEMICAL CONSTITUENTS OF SOIL WATER,

Agricultural Research Service, Fort Collins, Colo.
H. R. Duke, and H. R. Haise.

Soil Science Society of America Proceedings, Vol 37, No 6, p 963-964, November-December 1973. 3 fig.

Descriptors: *Percolation, *Infiltration, *Sampling, *Instrumentation, *Infiltrometers, *Soil moisture meters, Soil water.

A vacuum extractor, consisting of a porous ceramic tube within a sheet-metal trough, provides a quantitative measure of soil water lost by deep percolation and a water sample for chemical analysis. Several of these extractors were installed in the field and preliminary field performance is reported. (Knapp-USGS)

W74-03779

WATER-SEDIMENT SPLITTER FOR RUNOFF SAMPLES CONTAINING COARSE-GRAINED SEDIMENT,

Agricultural Research Service, Watkinsville, Ga.
For primary bibliographic entry see Field 2J.

W74-03780

APPLICATION OF REMOTE SENSING TO RIVER MECHANICS,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2E.

W74-03800

FLOODS IN IOWA: TECHNICAL MANUAL FOR ESTIMATING THEIR MAGNITUDE AND FREQUENCY,

Geological Survey, Iowa City, Iowa.

For primary bibliographic entry see Field 4A.

W74-03805

PIEZOELECTRIC PRESSURE TRANSDUCERS.

Measurements and Data, Vol 7, No 5, p 92-98, September/October 1973. 18 fig, 1 tab.

Descriptors: Pressure, Measurement, Electrical equipment, *Instrumentation.

Identifiers: *Pressure transducers, *Piezoelectric transducers, Sensors.

The theory piezoelectric transducers is reviewed, and manufacturers, types of pressure transducers and their sensitivity, range, frequency response, special capabilities, and price are listed. (Little-Battelle)

W74-03870

APPLICATION OF A NEW METHOD FOR PHOSPHATE CONCENTRATION MEASUREMENTS IN NATURAL AND WASTE WATERS,

Wisconsin Univ., Milwaukee. Dept. of Chemistry.

For primary bibliographic entry see Field 5A.

W74-03900

WEST SIDE CROP ADAPTABILITY STUDY.

California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 3F.

W74-03922

LOSS OF MERCURY FROM WATER DURING STORAGE,

Environmental Health Lab., McClellan AFB, Calif.

For primary bibliographic entry see Field 5A.

W74-04048

Field 7—RESOURCES DATA

Group 7B—Data Acquisition

GELATIN COATED MICROSCOPE SLIDES IN SEDIMENTARY SIZE ANALYSIS,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W74-04055

MEASURING VOLUMES OF SEDIMENTARY GRAINS,
Puerto Rico Univ., Mayaguez. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W74-04056

APPARATUS FOR STUDIES OF ARTIFICIAL SEDIMENTS,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Baas-Becking Geobiological Lab.
For primary bibliographic entry see Field 2J.
W74-04057

DETERMINATION OF ORGANIC CARBON IN MODERN CARBONATE SEDIMENTS,
Geological Survey, Denver, Colo. Office of Energy Resources.
For primary bibliographic entry see Field 2J.
W74-04059

ABSORPTIOMETRIC DETERMINATION OF TRACE AMOUNTS OF SULPHIDE ION IN WATER,
Mosul Univ. (Iraq). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04072

AN ELECTROCHEMICAL METHOD FOR MONITORING THE OXYGEN CONTENT OF AQUEOUS STREAMS AT THE PART-PER-BILLION LEVEL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-04104

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE MONTICELLO NUCLEAR GENERATING PLANT, MONTICELLO, MINNESOTA, AUGUST 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-04185

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING BIG ROCK POINT NUCLEAR PLANT, BIG ROCK POINT, MICHIGAN, 1968.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-04186

ANERIAL DETECTION OF SPILL SOURCES,
McDonnell Aircraft Co., St. Louis, Mo. Renaissance Lab.
For primary bibliographic entry see Field 5A.
W74-04196

EXPLICIT CALIBRATION OF THE PILLS II SYSTEM,
Environmental Systems Corp., Knoxville, Tenn.
For primary bibliographic entry see Field 5D.
W74-04198

ASSESSMENT OF COASTAL CHANGES WITH THE AID OF PHOTOGRAVIMETRIC AND COMPUTER-AIDED TECHNIQUES,
University Coll. of Wales, Aberystwyth. Dept. of Geography.
C. Kidson, and M. M. M. Manton.

Estuarine and Coastal Marine Science, Vol 1, No 3, p 271-283, July 1973. 8 fig, 3 plate 22 ref.

Descriptors: *Geomorphology, *Coasts, *Photogrammetry, *Aerial photography, Beaches, Intertidal areas, Mud flats, Shores, Topography, Tides, Mapping, Terrain analysis, *Remote sensing, *Bays.

The study of landforms can easily take advantage of photogrammetric techniques. The coast and the nearshore zone include landforms where the operation of both marine and terrestrial processes produce changes more rapidly than elsewhere. At the same time this interface between land and sea also introduces special difficulties in topographic survey and the recording of changes. Examples are taken from the southwest peninsula of England. At Bridgwater Bay, Somerset, a low marsh coast is fringed by a very wide intertidal zone because the tidal range is one of the highest in the world. This introduces problems which only photogrammetry can adequately solve. Deep mud inhibits conventional ground survey and problems of access make interpretation of foot a matter of great difficulty. In Barnstaple Bay, a rocky coast with steep cliffs and relatively narrow shore platforms cut in steeply dipping rocks causes contrasting problems and solutions. (Knapp-USGS)
W74-04271

7C. Evaluation, Processing and Publication

THE OPTIMAL EXPANSION OF A WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 6A.
W74-03754

SUSPENDED-SEDIMENT SAMPLING VARIABILITY,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 2J.
W74-03801

FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON, PART 2,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W74-03803

WATER RESOURCES OF THE NORTHERN CHEYENNE INDIAN RESERVATION AND ADJACENT AREA, SOUTHEASTERN MONTANA,
Geological Survey, Washington, D.C.
W. B. Hopkins.
For sale by USGS, Washington, D.C. 20242 Price \$1.00 per set. Hydrologic Investigations Atlas HA-468, 1973. 2 sheets, 2 maps, 2 tab, 6 ref.

Descriptors: *Water resources, *Hydrologic data, *Water yield, *Water quality, *Montana, Hydrology, Surface waters, Groundwater movement, Precipitation(Atmospheric), Streamflow, Runoff, Flow rates, Water wells, Hydrogeology, Aquifer characteristics, Chemical analysis, Water utilization, *Indian reservations, *Maps.

Water resources of the Northern Cheyenne Indian Reservation, Montana, and adjacent area are described in terms of sources, amounts available, and quality. The study area includes about 2,500 square miles of the unglaciated Missouri Plateau part of the Great Plains province in southeastern Montana. Present water use is small as only about 2,500 people live on the reservation, and approximately 1,000 more live on ranches in the rest of the area. The average annual precipitation from 1960 through 1968 was 14.47 inches. Wells and springs yield water for domestic or stock supplies from the

alluvium in stream valleys; from clinker beds, sandstone and coal beds in the Tongue River Member of the Fort Union Formation; and from sandstone beds in the Hell Creek Formation. Wells that would yield more than 50 gpm would be limited to the alluvium along the perennial streams. Most of the report area is drained by the Tongue River and its tributaries. The concentration of dissolved solids in the Tongue River in water year 1968 varied from 674 mg/liter in March, when streamflow was low, to 190 mg/liter in May and June. (Woodard-USGS)
W74-03809

GROUNDWATER DATA IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES, CALIFORNIA, SPRING 1970 TO SPRING 1973,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-03814

FLOODS OF THE 1970 AND 1971 WATER YEARS IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 2E.
W74-03816

ANNUAL COMILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ELM FOKK TRINITY RIVER, TRINITY RIVER BASIN, TEXAS, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-03818

APPLICATION OF STATISTICAL METHODS IN HYDROLOGY (PRIMENENIYE STATISTICHESKIH METODOV V GIDROLOGII).
Gosudarstvennyi Gidrologicheskii Institut, Lenigrad (USSR).
For primary bibliographic entry see Field 6B.
W74-03831

DATA OF GLACIOLOGICAL STUDIES. CHRONICLE AND DISCUSSIONS (MATERIALY GLYATSIOLOGICHESKIH ISLEDOVANIY. KHRONIKA, OBSUZHDENIYA).
Akademii Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 2C.
W74-03835

A SYSTEMATIC APPROACH TO THE ANALYSIS OF MEANS. PART II. ANALYSIS OF CONTRASTS. PART III. ANALYSIS OF NON-NORMAL DATA,
General Electric Co., Cleveland, Ohio.
E. G. Schilling.
Journal of Quality Technology, Vol 5, No 4, p 147-159, October 1973. 6 fig, 7 tab, 19 ref.

Descriptors: *Statistical methods, *Quality control, Mathematical models, Reliability, Average.
Identifiers: *Analysis of contrasts, *Analysis of means, Contrasts, Standard deviation, Yates method, Ott's method, Experimental design, Binomial distribution, Lewis-Ott method.

The derivation of analysis of means from the experimental model discussed in Part I (A Systematic Approach to the Analysis of Means) (See W74-00626) provides a systematic procedure for application of Ott's method to a variety of experiment designs. Analysis of contrasts makes available an extension of the Ott technique for 2 to the p power experiments to other forms of contrasts. For 2 to the p power experiments they are equivalent. The use of Scheffe's S-Method for setting limits on the contrasts introduces the ability to assess contrasts

ENGINEERING WORKS—Field 8

Structures—Group 8A

selected either before or after the experiment was run. This it can be used to supplement analysis of means. While each procedure may be used independently, a rational analysis might consist of the following three elements: (1) ANOVA-to initially detect significance, (2) ANOME-to describe the fluctuations in the data leading to significance and graphically reveal the results of the experiment, (3) ANCON-to test and graphically present differences apparent after running ANOME. Many examples exist of practical and profitable application of the Lewis-Ott procedure to a variety of problem areas. Extension of analysis of means to non-normal distribution and to attributes data where the normal approximation to the binomial distribution does not apply should increase the potential for application of the method still further. (Mortland-Battelle)
W74-03837

A SURVEY OF PREDICTION INTERVALS AND THEIR APPLICATIONS,
General Electric Corporate Research and Development, Schenectady, N.Y.
G. J. Hahn, and W. Nelson.
Journal of Quality Technology, Vol 5, No 4, p 178-188, October 1973. 58 ref.

Descriptors: *Statistical methods, *Forecasting, Probability, Regression analysis, Mathematical models.

Identifiers: *Prediction intervals, Binomial distribution, Exponential distribution, Poisson distribution, Weibull distribution, Bayesian prediction, Lognormal distribution, Gamma distribution, Multivariate normal distribution.

Prediction intervals to contain the results of a single future sample with a specified probability gamma are discussed. Also given are simultaneous prediction intervals to contain with probability gamma the results of each of k future samples. Precise definitions of these two types of intervals are given and a variety of prediction intervals for a future sample from a normal population are described. Prediction intervals are provided for samples from a binomial population, and distribution-free prediction intervals are discussed. References concerning prediction intervals for various other situations are given. The discussion is limited to describing and illustrating the methods for constructing prediction intervals. It is assumed throughout that both the past and the future samples are obtained with simple random sampling from the same population. The validity of prediction intervals depends strongly on this key assumption. (Mortland-Battelle)
W74-03858

GUIDE TO SELECTING PROGRAMMABLE DC POWER SUPPLIES,
A. Krigman.

Instruments and Control Systems, Vol 46, No 10, p 46-53, October 1973. 1 fig, 1 tab.

Descriptors: *Electrical equipment, Electronic equipment.
Identifiers: *Programmable power supplies, *Power supplies.

Operation, performance, and available features of programmable dc power supplies are discussed. Manufacturers and specific equipment capabilities are listed. (Little-Battelle)
W74-03863

A GENERAL PROCEDURE FOR CONSUMPTION-DENSITY STUDIES,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W74-04040

FIELD WATER-QUALITY INFORMATION ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 THROUGH SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W74-04054

LOGNORMAL SIZE DISTRIBUTION OF PARTICULATE MATTER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-04058

DIGITAL COMPUTER PROGRAMS FOR THE COST ENGINEER,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W74-04087

ENCYCLOPEDIC DICTIONARY OF EXPLORATION GEOPHYSICS,
Chevron Oil Co., Houston, Tex. Geophysical Div.
For primary bibliographic entry see Field 8B.
W74-04142

DOSE ESTIMATIONS FOR THE HYPOTHETICAL USE OF NUCLEARLY STIMULATED NATURAL GAS IN THE CHEROKEE STEAM ELECTRIC STATION, DENVER, COLORADO,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-04177

CHANGES IN STATISTICAL PROCESSING OF GROUNDWATER LEVEL MEASUREMENTS (WANDLUNGEN BEI DER STATISTISCHEN AUFBEREITUNG VON GRUNDWASSERSTANDMESSWERTEN),
For primary bibliographic entry see Field 2F.
W74-04247

STATISTICAL CHARACTERISTICS OF THUNDERSTORMS IN YAKUTSK ASSR (STATISTICHESKIYE KHARAKTERISTIKI GROZ YAKUTII),
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).
For primary bibliographic entry see Field 2B.
W74-04253

BASE OF FRESH GROUND WATER (APPROXIMATELY 3,000 MICROMHOS) IN THE SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Washington, D.C.

R. W. Page.
For sale by USGS, Washington, D.C. 20242 Price \$0.75. Hydrologic Investigations Atlas HA-489, 1973. 1 sheet, 1 map, 25 ref.

Descriptors: *Water quality, *Groundwater, *Mapping, *Geological surveys, *California, Freshwater, Aquifer characteristics, Salinity, Oil fields, Water wells, Water types, Calcium chloride, Sodium chloride, Measurement, Specific conductivity, Dissolved solids, Hydrologic data, Irrigation.
Identifiers: *San Joaquin Valley(Calif.).

This one-sheet atlas describes the quality of groundwater in San Joaquin Valley, California. The study area, the southern eight-ninths of the San Joaquin Valley, includes about 10,000 square miles of the valley floor. The warm climate, rich soil, and extensive irrigation make the San Joaquin Valley the largest single agricultural area in the State and one of the most productive agricultural

areas in the country. For the purpose of this study, freshwater is defined as that water having a maximum specific conductance of 3,000 micromhos per centimeter, about 2,000 milligrams per liter dissolved solids. The body of fresh groundwater in the San Joaquin Valley is contained in principally unconsolidated continental deposits of Pliocene to Holocene age that extend to depth ranging from less than 100 to more than 3,500 feet. (Woodard-USGS) W74-04274

WATER RESOURCES OF WISCONSIN, ST. CROIX RIVER BASIN,
Geological Survey, Washington, D.C.
H. L. Young, and S. M. Hindall.
For sale by USGS, Washington, D.C. 20242, Price \$1.75 per set. Hydrologic Investigations Atlas HA-451, 1973. 4 sheets, 49 ref.

Descriptors: Water resources, *Hydrologic data, *Water yield, *Water quality, *Wisconsin, River basins, Hydrology, Surface waters, Groundwater movement, Precipitation(Atmospheric), Streamflow, Runoff, Flow rates, Water wells, Hydrogeology, Aquifer characteristics, Water analysis, Chemical analysis, Water pollution sources, Water utilization, Water balance, *Maps. Identifiers: *St. Croix River basin(Wis.).

This 4-sheet atlas describes the physical environment, availability, distribution, movement, quality, and use of water in the St. Croix River basin, Wisconsin, as an aid in future planning of water management. The region comprises an area of 4,828 square miles in northwestern Wisconsin. It includes the part of the St. Croix River basin in Wisconsin, and 488 square miles of direct drainage to the Mississippi River between the St. Croix and Chippewa River basins; it comprises 8.6% of the State and consists of parts of 10 counties. Average annual precipitation on the basin was 29.3 inches during 1931-60; periods of drought are infrequent. February is normally the driest month (less than 0.8 inch), and June is the wettest month (about 4.8 inches). Snowfall comprises about 15% of the annual precipitation. An average of about 3,200 cfs, or 9 inches of water per year, runs off the basin. The long-term net change in ground- and surface-water storage in the basin is negligible. Dissolved solids, alkalinity, and hardness of surface waters vary inversely with discharge because they have a relatively constant input from groundwater discharge and are diluted by overland runoff. Sediment yields in the St. Croix River basin are among the lowest in Wisconsin. (Woodard-USGS) W74-04275

8. ENGINEERING WORKS

8A. Structures

TTEMPORARY NAVIGATION LOCK (MODIFICATION OF LOCK AND DAM 53) (FINAL ENVIRONMENTAL IMPACT STATEMENT), OHIO RIVER, ILLINOIS AND KENTUCKY,
Army Engineer District, Nashville, Tenn.

Available from National Technical Information Service as EIS-IL-73-0562-F. \$3.75 in paper copy, microfiche \$1.45. January 1973. 21 p, 2 tab.

Descriptors: *Dams, *Locks, *Ohio River, *Construction, Illinois, Kentucky, Dusts, Environmental effects, Rivers, Waterfowl.
Identifiers: *Environmental impact statement, *Pulaski County, Ill., *Ballard County, Ken., Noise, Turbidity, Army Corps of Engineers.

The proposed action is associated with the modification of lock and dam 53 on the Ohio River in Pulaski County, Illinois, and Ballard County, Kentucky. The proposed action consists of construction of a temporary lock and dam for the purpose

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of alleviating traffic congestion on the lower Ohio River until a more permanent solution can be implemented. The environmental impact of the construction would be to alleviate serious traffic problems by providing efficient and safe passage for river traffic. There would be temporary downstream turbidity during the construction. It may become necessary to coordinate construction activities with the winter waterfowl hunting on the adjacent Kentucky State Wildlife Management Area, depending upon the left bank access during construction. Also, the local economy would be enhanced temporarily during the construction period. Temporary turbidity, noise, and dust associated with the construction activities are the adverse environmental effects anticipated during the project implementation. The only alternatives are for no project or use of non-structural measures. (Daniels-Florida)
W74-03966

OAKLAND INNER HARBOR, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, San Francisco, Calif.
Avail. from Nat. Tech. Info. Serv., as EIS-CA-73-0761-F. \$5.25 in paper copy, \$1.45 in microfiche.
February, 1973. 67 p, 7 map, 3 tab, 1 ref.

Descriptors: *Environmental effects, *Dredging, *Channels, *Channel improvement, *California, Harbors, Biological communities, Sediment control, Chemicals, Disposal, Environmental control, Plankton, Sessile algae, Burrows, Turbidity, Aquatic environment, Absorption, Planning, Project planning, Feasibility studies.

Identifiers: *Environmental impact statements, *Alameda County(Cal).

A final environmental impact statement has been submitted on the Oakland Inner Harbor of Alameda County, California. The project calls for navigation improvement by deepening the existing channel of the inner harbor. The dredged materials are to be disposed partly at a selected disposal site and partly at sea. Disturbance of bottom sediment during the dredging is foreseen as well as increased turbidity at the dredging and disposal sites. There will be a temporary reduction in the productivity of the biotic community. Release of sediment and absorbed chemicals into the water and removal of deeper substrate material which houses burrowing organisms will have adverse environmental effects on the harbor. Furthermore, the transitory increase in turbidity during dredging and disposal with possible smothering of plankton and sessil benthic organisms will adversely affect the environment. Alternatives include no action, land disposal, ocean disposal of all material or disposal of all materials at Alcatraz. (Daniels-Florida)
W74-04027

8B. Hydraulics

ILLINOIS STORM SEWER SYSTEM SIMULATION MODEL: USER'S MANUAL,

Illinois Univ., Urbana. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5D.

W74-03763

FLOW OVER ALLUVIAL BED,

Colorado State Univ., Fort Collins. Engineering Research Center.

For primary bibliographic entry see Field 2E.

W74-03786

REGIME PROBLEMS OF RIVERS FORMED IN SEDIMENT,

Alberta Univ., Edmonton.

For primary bibliographic entry see Field 2J.

W74-03789

DEWATERING OF THE CLAYTON FORMATION DURING CONSTRUCTION OF THE WALTER F. GEORGE LOCK AND DAM, FORT GAINES, CLAY COUNTY, GEORGIA,

Geological Survey, Atlanta, Ga.

For primary bibliographic entry see Field 4B.

W74-03819

CONTRIBUTIONS TO THE THEORY OF SURFACE WAVES ON A VISCOUS FLUID,

Wisconsin Univ., Madison. Dept. of Mathematics.

For primary bibliographic entry see Field 2E.

W74-03901

ENVIRONMENTAL DETERMINATION USING HYDRAULIC EQUIVALENCE STUDIES,

Susquehanna Univ., Selinsgrove, Pa. Dept. of Geological Sciences.

For primary bibliographic entry see Field 2J.

W74-04060

PHYSICAL EFFECTS OF MAINTAINING DRAINAGE CHANNELS IN NORTH CAROLINA'S COASTAL AREA,

Soil Conservation Service, Raleigh, N.C.

For primary bibliographic entry see Field 2E.

W74-04075

FILTRATION BEHAVIOR OF CIRCULATING DRILLING FLUIDS,

Koninklijke-Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).

C. Bezemer, and I. Havenaar.

Society of Petroleum Engineers Journal, Vol 6, No 4, p 292-298, December, 1966. 5 fig, 6 tab, 7 ref.

Descriptors: *Drilling fluids, *Filtration, Laboratory equipment, *Mud, Rotary drilling, Laboratory & its, Slurries, Darcy's law, Physical properties.

Identifiers: Dynamic filtration, *Filter cake thickness, Filter press, Filter apparatus.

Studies of dynamic filtration of muds were made in two instruments: (1) a porous pipe through which the mud was circulated; and (2) a dynamic filter apparatus in which mud flow was due to a rotating cylinder. Both devices are described. They were found to give identical relations between equilibrium filtration data and rate of shear at the cake surface. The dynamic filter apparatus is suitable for routine measurements on small amounts of mud. In general, the equilibrium filtration rate was found to be directly proportional to the rate of shear at the cake surface, and the cake thickness inversely proportional. In the temperature range of 75-140°F and pressures of 50-200 psi, it was noted that (1) equilibrium filtration rate was but little affected; (2) equilibrium cake thickness increased with temperature (if permeability of cake remains unchanged, cake thickness is inversely proportional to viscosity of the mud filtrate), and (3) equilibrium cake thickness is hardly affected by filtration pressure because cake permeability is almost inversely proportional to filtration pressure. (Gray-NWWA)
W74-04141

ENCYCLOPEDIC DICTIONARY OF EXPLORATION GEOPHYSICS,

Chevron Oil Co., Houston, Tex. Geophysical Div.

R. E. Sheriff.

Society of Exploration Geophysicists, Tulsa, Oklahoma. 1973. 266 p.

Descriptors: *Geophysics, Borehole geophysics, Exploration, Seismology, Gravimetry, Logging.

Identifiers: Fourier transforms, Sea-state scale, *Geodesy, *Dictionaries.

This dictionary was compiled for practical geophysicists rather than for researchers or other specialists. Common geologic terms are included.

and popular information like sea-states and earthquake intensity scales are also provided. Terms are expressed in both English and metric unit systems. Tables are provided for the following: Beaufort wind scale and Douglas sea-state scale, fault types, filtering, Fourier transforms, major geodetic systems, magnetic quantities and units, number systems, positioning and navigation systems, stacking, and types of well-log measurements and applications. Entries usually provide a definition, a cross-reference where necessary, trade names, preferred usage terms, references, and figures where appropriate. (Staplin-NWWA)
W74-04142

THE 'TENACIOUS' IRON BACTERIA,

Universal Oil Products, St. Paul, Minn. Johnson Div.

For primary bibliographic entry see Field 5B.

W74-04143

A GENERAL PRESSURE BUILDUP THEORY FOR A WELL IN A CLOSED DRAINAGE AREA,

Stanford Univ., Calif.

H. J. Ramey, Jr., and W. M. Cobb.

Journal of Petroleum Technology, Vol 23, No 12, p 1493-1505, December, 1971. 7 fig, 1 tab, 20 ref.

Descriptors: *Pressure, *Flow, *Graphical methods, *Mathematical studies, Diffusivity, Theis equation, *Wells, Groundwater reservoirs, Drawdown, Permeability, *Drainage.

Identifiers: Buildup, Skin effect, Horner, Muskat, Miller-Dyes-Hutchinson, van Everdingen-Hurst, Wellbore storage, Afterflow.

At least 200 papers on buildup theory have been published in the last 30 years but no completely general theory of pressure buildup for closed drainage shapes has appeared. A general theory is developed for pressure buildup for a well in any location within an ideal closed reservoir of any shape. The usual assumptions of constant reservoir thickness, porosity and permeability were made, along with constant compressibility of the liquid and small pressure gradients. Three principal methods of buildup analysis were reviewed, namely, those of (1) Muskat, (2) Miller-Dyes-Hutchinson, and (3) Horner (Theis or van Everdingen-Hurst). All three methods can be applied to any set of pressure buildup data over proper ranges of buildup time. Horner-type plotting appears most generally applicable to the initial transient data for short buildup time. Miller-Dyes-Hutchinson can be used when the producing time is not known, or can be estimated only roughly. Muskat plotting is appropriate for a portion of the buildup data taken in the transition region between the initial transient period and fully static pressure. Some observations were made on drawdown analysis in comparison with buildup analysis. (Gray-NWWA)
W74-04144

DETERMINING FORMATION WATER RESISTIVITY FROM CHEMICAL ANALYSIS.

Sinclair Oil and Gas Co., Tulsa, Okla.

For primary bibliographic entry see Field 2K.

W74-04145

A METHOD FOR DETERMINING THE STATIC PRESSURE OF A WELL FROM BUILDUP DATA,

Mobil Research and Development Corp., Dallas, Tex.

For primary bibliographic entry see Field 8G.

W74-04162

APPLICATION OF ENGINEERING TO WELL CONSTRUCTION AND DEVELOPMENT AT VERNON,

Civil Engineering Association, Vernon, Calif.

ENGINEERING WORKS—Field 8

Hydraulics—Group 8B

J. W. Williams.
Journal American Water Works Association, Vol 56, No 7, p 899-906, July, 1964. 1 tab, 7 ref.

Descriptors: *Groundwater, *Wells, Casings, Drilling, Drilling fluids, *Specific capacity, Well screens, Gravels, *California.
Identifiers: Vernon(Calif), *Sand production, *Gravel packs.

Engineering techniques aided in the completion of a well with a greater specific capacity and far less sand production than any previous city well. Attention was given to drilling technique, drilling mud, surface casing, production casing, gravel packing, and development. Tested sand production averaged less than 10 ppm at 10 minutes after startup and less than 0.01 ppm during continuous operation. These characteristics resulted in substantially reduced costs and longer life expectancy of both well and pump, and low sand production could permit automatic operation. Increased specific capacity reduced lift by about 65 ft. and thus has reduced equipment requirements. (Staplin-NWWA)

W74-04167

AN INVESTIGATION OF BOTTOM CHANGES IN MONTEREY HARBOR (1932-1969),
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W74-04211

BUDGET OF LITTORAL SANDS IN THE VICINITY OF POINT ARGUELLO, CALIFORNIA,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 2J.
W74-04221

LAMINAR AND AXISYMMETRIC VERTICAL JETS IN A STABLY STRATIFIED ENVIRONMENT,
Esso Research and Engineering Co., Florham Park, N.J.
A. R. Tenner, and B. Gebhart.
International Journal of Heat and Mass Transfer, Vol 14, No 12, p 2051-2062, 1971. 7 fig, 10 ref, 2 append.

Descriptors: *Jets, *Buoyancy, *Stratification, *Shear, Fluid mechanics, Hydraulics, Flow, Density, Turbulence, Model studies, Mathematical models, Laboratory tests, Viscosity, Laminar flow, Reynolds number.
Identifiers: *Laminar jets.

Experiments have shown that an axisymmetric, laminar, buoyant jet in a stably stratified environment induces the flow of a toroidal cell around itself. The inner portion of the cell is driven upward by the viscous shearing of the jet, and the outer portion descends due to a negative buoyancy force. Under certain limiting conditions this cell draws along a thin layer of the lower density jet and surrounds itself with it in the form of a shroud. The shroud flows in a direction opposite to the jet. Conditions favorable to shroud production require that the environment be stably stratified and that the molecular diffusivities of the fluids involved be extremely small. Turbulent jets are not expected to produce an appreciable shroud. (Jerome-Vanderbilt)
W74-04224

AN IMPROVED MIXING LENGTH THEORY OF TURBULENT HEAT AND MASS TRANSFER,
Clarkson Coll. of Technology, Potsdam, N.Y.
Dept. of Chemical Engineering.
M. R. Doshi, and W. N. Gill.
International Journal of Heat and Mass Transfer, Vol 14, No 9 p 1355-1362, 1971.

Descriptors: *Heat transfer, *Mass transfer, *Temperature, Fluid mechanics, Hydraulics, Velocity, Flow, Convection, Diffusion, Mathematical models, Equations, Model studies, Turbulence, Laboratory studies, Data collections, Reynolds number, Mixing.
Identifiers: *Turbulent diffusion, Eddy diffusion.

An improved mixing length theory of turbulent heat and mass transfer is developed which applies more realistically when the velocity gradient, or the temperature gradient, or both are small. Attention is concentrated on heat transfer since appropriate data are available for comparison with the theory. Equations for mass transfer can be obtained in exactly the same fashion except when mass transfer rates are high enough for transverse convection to become important. The theory is applied to turbulent flow between parallel plates which are maintained at constant but different temperatures, and the results compare favorably with experimental data. (Jerome-Vanderbilt)

W74-04231

TEMPERATURE PROFILES FOR TURBULENT FLOW OF HIGH PRANDTL NUMBER FLUIDS,
Akron Univ., Ohio. Dept. of Mechanical Engineering.

International Journal of Heat and Mass Transfer, Vol 14, No 9, p 1465-1471, 1971. 3 fig, 18 ref.

Descriptors: *Hydraulics, *Heat transfer, *Mass transfer, *Temperature, *Pipe flow, Fluid mechanics, Flow, Eddies, Surfaces, Laboratory tests, Fluids, Model studies, Viscosity, Mathematics, Reynolds number, Density, Turbulence, Shear stress, Distribution patterns.
Identifiers: *Prandtl numbers, Schmidt number, Sherwood numbers, Nusselt numbers.

Harriott (1962) has developed a surface renewal and penetration model for turbulent mass transfer which accounts for the effect of eddies not moving into direct contact with the surface. It is based on the hypothesis that eddies move within random distances of the surface, remaining for various lengths of time. Calculations based on this model have been shown to be consistent with experimental data for the Nusselt and Sherwood numbers for fluids with large as well as moderate values of the Prandtl and Sherwood numbers. The model is employed in the estimation of temperature or concentration profiles associated with turbulent flow in order to further demonstrate its usefulness. Emphasis is placed on pipe flow with high Prandtl number fluids. (Jerome-Vanderbilt)

W74-04232

THERMAL INTERACTION OF TWO STREAMS IN BOUNDARY-LAYER FLOW SEPARATED BY A PLATE,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.

R. Viskanta, and M. Abrams.
International Journal of Heat and Mass Transfer, Vol 14, No 9, p 1311-1321, 1971.

Descriptors: *Momentum equation, *Heat transfer, *Mass transfer, *Thermal properties, *Boundary layers, Fluid mechanics, Hydraulics, Flow, Currents, Turbulence, Laminar flow, Viscosity, Temperature, Stream flow, Finite element analysis, Model studies, Mathematical models, Reynolds number, Energy equation, Inviscid flow.

The problem of heat exchange between two fluid streams in boundary layer flow separated by a flat plate is considered. A general analysis applicable to cocurrent or countercurrent, laminar or turbulent flow is presented. An exact solution for the temperature distribution and the heat transfer along the plate is obtained for the special case of constant property, cocurrent, inviscid flow. In the less restrictive case of constant property laminar or turbulent flow, the wall temperature and heat

flux are predicted using the method of superposition for which results of a desired degree of accuracy are possible. For the most general case of variable physical properties the finite difference solution of the momentum and energy equations in von Mises form is indicated. Finally, some illustrative results for cocurrent, constant property, laminar flow in the streams are reported. It is shown that heat exchange analyses which neglect the thermal interaction between fluid streams could be in serious error. (Jerome-Vanderbilt)

W74-04236

TRANSIENT HEAT AND MASS TRANSFER IN FULLY DEVELOPED LAMINAR TUBE FLOWS,
Saskatchewan Univ., Saskatoon. Dept. of Mechanical Engineering.

C. M. Tseng, and R. W. Besant.

International Journal of Heat and Mass Transfer, Vol 15, No 2, p 203-215, 1972. 12 fig, 20 ref.

Descriptors: *Fluid mechanics, *Heat transfer, *Mass transfer, *Temperature, *Laminar flow, Hydraulics, Tubes, Flow, Viscosity, Graphical analysis, Analytical techniques, Model studies, Mathematics, Boundary layers, Reynolds number.
Identifiers: Poiseville tube flow, Nusselt number.

The problem of unsteady heat or mass flux in a Poiseville tube flow is analyzed for incompressible flows with constant properties. The step function and impulse function response solutions are presented for the cases of adiabatic and constant temperature walls. The effects of unsteady flows are discussed. The results are valid for heat or mass transfer, but not simultaneous heat and mass transfer unless coupling effects are negligible. Some typical graphical results are presented. Time, axial length and radius are independent parameters. Consequently, the analytical solutions themselves are a more practical form of presentation than a graphical presentation. The solution permits calculation of local temperatures or concentrations. Typical results are presented for down-stream conditions of local temperature and Nusselt number. (Jerome-Vanderbilt)

W74-04237

SELF-SIMILAR SOLUTIONS FOR A THREE-COMPONENT AXISYMMETRICAL FLOW OF A VISCOUS FLUID,

G. I. Nazarov, and A. K. Yanko.

Fluid Mechanics—Soviet Research, Vol 2, No 4, p 74-78, July-August 1973. 3 ref. (Originally published in Gidromekhanika, No 19, p 62-65, 1971).

Descriptors: *Fluid mechanics, *Flow, *Viscous flow, Equations, Continuity equation.

Self-similar systems are investigated for steady axisymmetrical three-component flow of a viscous incompressible fluid to obtain exact solutions for the second problem of dynamics, when one of the external-forces components is treated as the sought quantity. Particular cases of exact solutions of flows of interest from the physical point of view are examined. (Josefson-USGS)

W74-04248

THE STRUCTURAL-CONTINUUM THEORY OF DILUTE SUSPENSIONS OF RIGID ELLIPOIDAL PARTICLES,
Kiev State Univ. (USSR).

Ye. Yu. Taras, and Yu. I. Shmakov.

Fluid Mechanics—Soviet Research, Vol 2, No 4, p 68-73, July-August 1973. 4 fig, 13 ref. (Originally published in Gidromekhanika, No 19, p 57-62, 1971).

Descriptors: *Fluid mechanics, *Hydrodynamics, *Flow, *Suspension, *Rheology, Non-Newtonian flow, Stress, Shear, Viscosity, Model studies, Equations.
Identifiers: USSR.

Field 8—ENGINEERING WORKS

Group 8B—Hydraulics

The phenomenological and structural approaches are used in the rheology of polymer solutions for constructing equations of state. Rheological equations of state are presented of dilute suspensions of rigid ellipsoidal particles and polymer solutions whose macromolecules are usually treated as rigid ellipsoids of revolution. These equations are obtained on the basis of Ericksen's rheological model of simple anisotropic fluids and the structural theories of intrinsic viscosity due to Jeffery, Peterlin, and Saito. (Josefson-USGS)
W74-04249

INVESTIGATION OF THE VELOCITY STRUCTURE IN THE BOTTOM REGION OF A TURBULENT WAVE FLOW,

V. L. Maksimchuk, and V. S. Nishchuk.
Fluid Mechanics--Soviet Research, Vol 2, No 4, p 12-18, July-August 1973. 4 fig, 2 tab, 7 ref. (Originally published in Gidromekhanika, No 18, 1971).

Descriptors: *Fluid mechanics, *Flow, *Turbulent flow, *Waves(Water), *Velocity, Viscosity, Resistance, Roughness(Hydraulic), Boundary layers, Fluctuations, Equations.
Identifiers: USSR.

In connection with studies of waveborne sediment transport, much emphasis has recently been placed on dynamics of the bottom region of a wave flow and on problems relating to wave transport of water. Knowledge of the structure of the bottom region of a flow can be used in considering the action of a turbulent wave flow on the bottom sediment layer. Kinematic characteristics in the boundary layer of a wave flow near a rough bottom, with dP/dx nearly equal to 0, were studied photographically in a small wave basin, 8 m in length, 16.2 cm wide, and at a water depth of 13.3 cm. A special boundary sublayer, whose thickness is a basic parameter in determining the resistance and velocity distribution in a flow, was revealed. Distribution of the rate of water transfer by a wave flow near the bottom is computed, and kinematic structure of a wave flow near a rough wall with motion of flow toward the shore (positive direction) and motion seaward (negative direction) is diagrammed. (Josefson-USGS)
W74-04250

8C. Hydraulic Machinery

AN APPLICATION STUDY IN WATER DISTRIBUTION CONTROL,

General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
R. DeMoyer, Jr., H. D. Gilman, and M. Y. Goodman.

Availability from NTIS as PB-227 336 \$3.25 in paper copy, \$1.45 in microfiche. Technical Information Series Document No 74SD200 January 1974, 42 p, 12 fig, 3 append. OWRR C-4340(No 9085)(1).

Descriptors: *Water distribution(Applied), *Automatic control, *Regression analysis, *Water demand, Networks, Simulation analysis, Computer models, Model studies, Operation costs, *Pennsylvania, Pumping plants, *Control systems. Identifiers: Regression modeling, Control strategy, Supervisory control(Water), Time-varying simulation, *Philadelphia.

The major objective was to apply a previously developed control algorithm for reducing costs of operation for the Roxborough High Service-West Oak Lane district of Philadelphia containing two pumping stations and one elevated storage tank. Generation of the control algorithm's pump switching lines was accomplished with a system of programs for simulating demand (using Fourier series) and operation of the district (using a regression analysis model) based on past logging data. The control algorithm was manually implemented

by operators at the City's Load Control Center for 1 month and resulted in: 1) 3.8% reduction (\$1420) in costs due to pumping and reappportionment of water from alternate sources; 2) Fewer pump changes; 3) Smoother tank depth profiles; and 4) Consistent operation of the district. These results were achieved without investments in additional equipment, operating personnel or field surveys. The complete software system for generating the control algorithm and performing simulation studies for a water distribution with elevated storage is programmed in FORTRAN IV for the GE-RESID timesharing computer (GE-635).
W74-03755

AUTOMATIC CONTROL OF LEVEL, PRESSURE, AND FLOW,

Cla-Val Co., Newport Beach, Calif. Commercial Sales Div.
L. Wolfe.

Journal American Water Works Association, Vol 65, No 10, p 654-662, October 1973. 27 fig.

Descriptors: *Automatic control, Pressure, Flow rates, Water levels, Control systems, Mechanical equipment.
Identifiers: *Valves.

Various types of valves for controlling level, pressure, and flow are diagrammed and the best ways for using them are discussed. Mechanical float, hydraulic float, solenoid, altitude, backpressure-control, rate-of-flow, relief, modulating float, pressure-reducing, pressure-sustaining, and check valves are considered. (Little-Battelle)
W74-03861

DISCHARGE SYSTEM FOR THE A.D. EDMONSTON PUMPING PLANT,

California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 3B.

W74-04038

OPERATION AND MAINTENANCE OF CENTRIFUGAL PUMPS,

Worthington Corp., Salt Lake City, Utah.

E. J. Watts.

Journal American Water Works Association, Vol 54, No 6, p 711-718, June 1962.

Descriptors: *Pumps, *Hydraulic equipment, Gears, *Centrifugal pumps, *Operations and maintenance.

Identifiers: *Bearings, Housings, Antifriction bearings, Gaskets, Shafts, Sleeves.

The most important steps are described in pump operation, lubrication and cleaning, and maintenance. Suction conditions, priming, starting and operation, and stopping pumps are discussed. Regular grease changes and regular lubrication are emphasized, with information presented on the following: grease-lubricated anti-friction bearings, oil-lubricated antifriction bearings, oil changes, constant level oil control, coupling lubrication, and repacking bearings and housings. With respect to pump maintenance, daily observations are suggested to avert trouble. Semiannual and annual inspections and complete overhauls are called for, with attention to casing, gaskets, wearing rings, shaft and shaft sleeves, and bearings. Performance tests are discussed. Procedures for proper storage of pumps are presented, as well as the minimum spare and repair parts that should be in stock at the installation. (Campbell-NWWA)
W74-04146

RADIO SYSTEM MONITORS PUMP STATIONS,

For primary bibliographic entry see Field 8G.
W74-04148

REMOTE CONTROL IS COMING,

Malcolm Pirnie, Inc., White Plains, N.Y.
H. Wasserman, and R. J. Dugandzic.
Water and Wastes Engineering, Vol 10, No 11, p 39-42, November, 1973. 3 fig.

Descriptors: Automation, *Automatic control, *Remote control, Electronic equipment, *Hydraulic equipment, Pumps, Engineering, *Ohio, *Connecticut.

Identifiers: Akron(Ohio), New Haven(Conn), Visual alarm system, Report-back functions.

Increasing emphasis is being placed on the use of remotely operated pumping stations in modern water supply stations. Operation of such stations involves sensors, control systems, and report-back arrangements. Pump operation is thus controlled, without benefit of immediate operator supervision, to provide a desired condition, or to meet the demands on a water supply distribution system. In remote control arrangements, the sensors may be used to detect storage tank level, system pressure, or flow in a main. Transmission of information and control functions is usually be electrical signal to the devices and recorders that control operation and/or display information. There are many variations of this basic arrangement. Detailed descriptions of two automated stations, one at Akron and one at New Haven are presented. (Hunt-NWWA)
W74-04153

BETTER PUMP INSTALLATION,

Bechtel Power Corp., Gaithersburg, Md.

J. C. Goldthorpe.

Journal American Water Works Association, Vol 65, No 8, p 571-574, August, 1973.

Descriptors: *Pumps, *Centrifugal pumps, Equipment, *Hydraulic machinery, Design, Specifications, Casing.
Identifiers: Shafts, Noise, Vibration.

A better specification will result in a better pump installation. The word 'specification' indicates a specific, precise set of instruction, and vague expressions or descriptions are therefore meaningless. Excellent detailed equipment and system application information is available from pump sales engineers and manufacturers. Presented is a broad overview of areas - bearings, casings, shafts, etc. - in which equipment specification and installation inspections are needed, and general standards for both are given. Also presented is a general discussion on applications of various types of pumps. (Hunt-NWWA)
W74-04154

8E. Rock Mechanics and Geology

ORGANIZATION OF FIELD TESTS AND EVALUATION OF TRICONE BIT PERFORMANCE USING STATISTICAL ANALYSIS AND SONIC LOGS,

Societe Nationale des Petroles d'Aquitaine, Pau (France).

For primary bibliographic entry see Field 8G.
W74-04160

8F. Concrete

WELL GROUTING AND WELL PROTECTION,

Layne and Bowler, Inc., Memphis, Tenn.

K. E. Moehr.

Journal American Water Works Association, Vol 56, No 4, p 423-431, April, 1964. 2 fig, 2 tab, 5 ref.

Descriptors: *Wells, *Grouting, *Cements, Construction materials, Sealants, Casings, Corrosion. Identifiers: *Portland cement, *Neat-cement slurry, Caving.

ENGINEERING WORKS—Field 8 Materials—Group 8G

The reasons for grouting and sealing wells are to protect the supply against pollution, to increase the life of the well by protecting the casing pipe against exterior corrosion, to seal out water of an unsatisfactory chemical quality, and to stabilize soil or rock formations which are of a caving nature. Materials described include Portland cement, neat-cement slurry, and special cement slurries. The operations discussed are the following: casing of wells, placement of grout, mixing of grout. Factors contributing to failures in well grouting are also reviewed. (Staplin-NWWA)
W74-04164

8G. Materials

DETERMINING FORMATION WATER RESISTIVITY FROM CHEMICAL ANALYSIS.
Sinclair Oil and Gas Co., Tulsa, Okla.
For primary bibliographic entry see Field 2K.
W74-04145

TRANSIENT PRESSURE TESTING OF FRAC-TURED WATER INJECTION WELLS,
Pan American Petroleum Corp., Tulsa, Okla.
K. K. Clark.
Journal of Petroleum Technology, Vol 20, No 6, p 639-643, June, 1968. 8 fig, 3 tab, 1 ref.

Descriptors: *Injection wells, *Fracture permeability, *Pressure, Flow, *Permeability, Hydraulics, *Flooding, Fractures, Ground water movement, Limestone, Oil reservoirs, *Texas.
Identifiers: *Vertical fractures, Shut-in test, Fractured formations, Fracture extension, Skin effect.

Excessive injection pressures in water injection wells may create deeply penetrating fractures, or may open existing fractures. If these fractures are oriented toward nearby oil-producing wells, water breakthrough may seriously reduce ultimate recovery. A method of calculating fracture lengths from pressure decline tests on the injection well is based on a linear-flow model that simulates conditions during a relatively short shut-in period. Fracture lengths can be calculated directly if permeability of the formation is known. A graphical technique is presented that gives fracture lengths based on permeabilities calculated from normal shut-in tests, where those permeabilities are adjusted for flow geometry. The method was applied to four injection wells in West Texas. These wells were open-hole completions in the Grayburg limestone at 4200 ft. At completion as oil producers, the wells had been stimulated with nitroglycerine. Prior to conversion to water injection, they had been oxidized and had minor fracturing treatment. The calculated fracture lengths appeared to be reasonable in view of the field observations on performance. (Gray-NWWA)
W74-04147

RADIO SYSTEM MONITORS PUMP STATIONS,
R. A. Young.
Pollution Engineering, Vol 3, No 6, p 24-25, November-December, 1971. 3 fig.

Descriptors: Automation, *Automatic control, Electronic Equipment, Instrumentation, Data transmission, *Remote control, Water works, Costs, *California, *Monitoring.
Identifiers: *Radio alarm reporting system, *San Diego County(Calif), Visual readout system, Alarm encoder.

Due to operational requirements caused by facility loading and terrain the San Diego County, California, Sanitary Engineering Division has turned to modern electronics in the form of a radio alarm reporting system to continually monitor eight widely spread pumping stations. A typical pumping station set up includes a power source, both commercial and emergency, radio transmitter and alarm

encoder. Each alarm station is set up to provide an immediate alarm as to location of the station, primary power failure, and wet well and dry well problems to the County Operation Center where it is received on a digital readout printer. The alarm systems components and functions are described. It is anticipated that as the population grows and additional pumping stations are added the radio alarm reporting system will continue to reduce the cost of checking the treatment facilities. (Hunt-NWWA)
W74-04148

NEW SINGLE-WELL TEST FOR DETERMINING VERTICAL PERMEABILITY,
Esso Production Research Co., Houston, Tex.
W. A. Burns, Jr.
Journal of Petroleum Technology, Vol 21, No 6, p 743-752, June, 1969. 12 fig, 9 ref.

Descriptors: *Permeability, *Vertical permeability, Flow, Diffusivity, Transmissivity, Porous media, Oil reservoirs, Computer models, Injection, Shales, *Wells.
Identifiers: Skin effect, Pressure drop, Shut-in pressure, *Horizontal permeability.

A single well can be tested to measure in-situ vertical permeability in addition to horizontal permeability. This test determines the vertical diffusivity and horizontal transmissibility. Conventional down-hole equipment is used between two isolated sets of perforations. Some details of the method are described, in addition to a listing of the factors involved in planning the test. The effectiveness of tight zones as barriers to vertical flow can be determined. Vertical tests across layers of different permeabilities will determine directly the harmonic average of the actual vertical permeabilities of each layer. Leaks due to faulty cementing behind casing will cause test values of vertical permeability to appear abnormally high. Skin damage will have the opposite effect. (Gray-NWWA)
W74-04150

CORROSION AND ITS PREVENTION IN WATERS,
National Chemical Lab., Teddington (England).
G. Butler and H. C. K. Ison.
Reinhold Publishing Corporation, New York, N.Y. 1966. 281 p.

Descriptors: *Corrosion, *Corrosion control, *Cathodic protection, Metallurgy, Paints, Cavitation, *Water treatment, *Inhibition, *Design.
Identifiers: Temperate factors, Flow factors, Metallic coatings, Non-metallic coatings.

A study is made of the principles of metallic corrosion, the phenomena that can occur, and the means of prevention and control of the corrosion problems arising from the contact of metals with water both natural and treated. Particular emphasis is placed on information and experience gained from the behavior and operation of industrial plants and equipment. The principles of corrosion and variations in water composition are described. The corrosion behavior of metals commonly used in the construction of plants and equipment is discussed, and the influence of mechanical and metallurgical factors and the variations in corrosion severity due to temperature and flow are also dealt with. Methods of corrosion prevention -- including water treatment and inhibition, the use of metallic and nonmetallic coatings and the application of cathodic protection are considered. The importance of the design and method of operation of industrial plants is emphasized. Methods of diagnosing corrosion failures are described. (Campbell-NWWA)
W74-04151

BETTER PUMP INSTALLATION,
Bechtel Power Corp., Gaithersburg, Md.

For primary bibliographic entry see Field 8C.
W74-04154

STANDARD METHOD OF EVALUATING DEGREE OF RUSTING ON PAINTED STEEL SURFACES.

American Society for Testing and Materials, Philadelphia, Pa.
ASTM Standard, ASTM D 610-68, 1970. 10 p, 5 fig, 1 tab.

Descriptors: *Corrosion, *Pitting, *Coatings, Materials, Evaluation.
Identifiers: *Rust.

Standard descriptions, and photographic and areal analysis for the classification of the degree or grades of rusting on painted steel surfaces are presented. (Hunt-NWWA)
W74-04156

CATHODIC PROTECTION IN CONGESTED AREAS,

Hinchman Corp., Detroit, Mich.
L. H. West.
Journal American Water Works Association, Vol 56, No 6, p 721-726, June, 1964. 3 fig, 1 tab.

Descriptors: *Cathodic protection, *Anodes, *Rectifiers, *Leakage, Design, Maintenance.
Identifiers: Pipe-to-soil voltage.

If two or more structures, owned by separate parties, are closely spaced or interwoven in a congested area, they may be bonded together and protected cathodically as one unit. It is very important to have plenty of current reaching metal surfaces and to have safe pipe-to-soil voltages at these locations, because of greater-than-average hazards and costs of leakage. Galvanic anodes and small point-type rectifiers are offered as alternative methods to provide adequate protection for underground structures. Design considerations are presented, and systems maintenance is emphasized and reviewed. (Campbell-NWWA)
W74-04159

ORGANIZATION OF FIELD TESTS AND EVALUATION OF TRICONE BIT PERFORMANCE USING STATISTICAL ANALYSIS AND SONIC LOGS,
Societe Nationale des Petroles d'Aquitaine, Pau (France).

J. C. Raynal, S. A. Gstalder, A. M. Sagot, and J. A. Muckleroy.
Journal of Petroleum Technology, Vol 23, No 4, p 506-512, April, 1971. 9 fig, 2 tab, 10 ref.

Descriptors: *Bits, *Statistical methods, *Electrical well logging, *Rock properties, *Frequency curves, *Data processing, Distribution patterns, Marti.
Identifiers: Sonic log, Tricone bit, Standard deviation, F test, Student's t test, Variations, Gaussian distribution, Economic index.

Lack of precision in the results of drilling tests with new designs of bits hinders progress in bit design. Drilling results may be expressed as: (1) footage drilled per hour; (2) footage drilled per bit, and (3) cost per bit. The formations drilled are heterogeneous, and there is lack of precision in the measurement of the variables that affect drilling (such as weight on bit, wear when pulled, revolutions per minute, etc.). Consequently, drilling performance variations of as much as 30% for consecutive tricone bits may be attributed to formation variations alone. Efforts should be directed toward better organization of the field tests, more precise measurements and more attention to identification of formation heterogeneity. The sonic log is recommended as one method of defining variations in hardness of the rock. The application of statistical methods is discussed briefly and an example is shown of the use of the technique in

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Group 8G—Materials

a comparison of two families of bits under similar conditions. (GraynNWWA) W74-04160

CORROSION AND CORROSION CONTROL,
Massachusetts Inst. of Tech., Cambridge. Corrosion Lab.
H. H. Uhlig.
John Wiley and Sons, New York, N.Y. Second edition 1971. 419 p.

Descriptors: *Corrosion, *Corrosion control, *Pitting, Chemical reactions, Metallurgy, Coatings, Paints, Stainless steel.
Identifiers: Pourbaix diagrams, *Intergranular corrosion, Stress cracking, Corrosion fatigue.

The electrochemical principles underlying corrosion reactions are discussed as well as the scientific principles upon which control of corrosion is based. Environmental effects on properties of metals and alloys are described. Practical and engineering applications are cited which illustrate how basic corrosion science is usefully employed. The main emphasis is on quantitative principles and engineering calculations rather than on descriptive case histories. Most of the material in this edition has been updated to incorporate the rapid advances made in corrosion science and engineering. The featured revisions and additions include: detailed descriptions of critical pitting potential and stress corrosion cracking; complete chapters on corrosion fatigue and passivity; new material on the intergranular corrosion of non-sensitized stainless steels and related alloys; and an elementary description of Pourbaix diagrams. (Staphin-NWWA) W74-04161

A METHOD FOR DETERMINING THE STATIC PRESSURE OF A WELL FROM BUILDUP DATA,
Mobil Research and Development Corp., Dallas, Tex.
A. S. Odeh, and R. Al-Hussainy.
Journal of Petroleum Technology, Vol 23, No 5, p 621-624, May, 1971. 4 fig, 1 tab, 6 ref.

Descriptors: *Pressure, Time, *Graphical methods, Drainage area, Oil reservoirs, Gases, *Wells.
Identifiers: *Static pressure, *Boundary effect, Shut-in pressure, Bottom-hole pressure.

A method is described for the determination of the static pressure of a well from the buildup test data. It differs from the commonly used methods in that it does not require the knowledge of the porosity and permeability of the productive zone, the viscosity and compressibility of the produced fluid, and the drainage area of the well. It does, however, require the value of the pressure at time zero. The derivation and analysis of the method are given and the general application is discussed. The method is illustrated by calculations based on buildup data from an oil well and a gas well. (GraynNWWA) W74-04162

WELL GROUTING AND WELL PROTECTION,
Layne and Bowler, Inc., Memphis, Tenn.
For primary bibliographic entry see Field 8F.
W74-04164

THE RELATIONSHIP BETWEEN GALVANIC CURRENT AND DISSOLUTION RATES,
Rockwell International Corp., Thousand Oaks, Calif. Science Center.
F. Mansfield.
Corrosion, Vol 29, No 10, p 403-405, October, 1973. 2 fig, 11 ref.

Descriptors: *Corrosion, *Electrochemistry, Chemical reaction, Anodes, Cathodes, Instrumentation.
Identifiers: Dissolution rates, *Galvanic corrosion, Corrosion potential.

The recent development of instrumentation suitable for accurate determination of galvanic currents suggests that more data of this nature will be gathered and reported. It is shown that galvanic current data cannot be an accurate measure of dissolution rates. Correction of galvanic current data is possible, however, and correction procedures are explained for two limiting cases. Experimental support for the relationships derived is presented for Al alloys in aerated 3.5% NaCl coupled to a variety of dissimilar metals and alloys. (Hunt-NWWA) W74-04168

SYNERGISTIC INHIBITION OF FERRIC ION CORROSION DURING CHEMICAL CLEANING OF METAL SURFACES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Engineering Materials Lab.
M. A. Streicher.
Corrosion, Vol 28, No 4, p 143-148, April, 1972. 4 fig, 2 tab, 12 ref.

Descriptors: Corrosion, *Corrosion control, *Inhibition, *Rusting, Scalings, Chemistry, *Electrochemistry.
Identifiers: Potentiostatic polarization, Surface active agent, Synergistic inhibition.

To minimize attack on metals during cleaning with acid solutions containing dissolved iron in the ferric state, both hydrogen evolution corrosion and ferric ion corrosion must be effectively inhibited. There are many inhibitors which effectively reduce hydrogen evolution corrosion, but these have a relatively small effect on ferric ion corrosion. Data are provided which show the synergistic action of certain substituted thioureas and thioamides with certain alkali metal and amine alkyl or alkylarylsulfonates and sulfonated esters in effectively inhibiting both ferric ion and hydrogen evolution corrosion on ferrous and other metals during exposure to a variety of acids. Potentiostatic measurements indicate that inhibition is a result of retardation of cathodic reactions. (Hunt-NWWA) W74-04169

8I. Fisheries Engineering

INVESTIGATIONS OF NUTRITION AND METABOLISM OF CATFISH AND UTILIZATION OF FISHERIES PRODUCTS,
Kansas State Univ., Manhattan.
O. W. Tiemeier, and C. W. Deyoe.
Available from NTIS, Springfield, Va 22151 COM-72-11300, Price \$3.00 printed copy, \$1.45 microfiche. National Marine Fisheries Service Contract Report (NOAA), January 1972. 103 p, 35 fig, 36 tab, 5 ref.

Descriptors: *Fish diets, *Nutrient requirements, *Catfishes, *Fishes, *Fish management, Surveys, Food habits, Fish food organisms, Proteins, Fish physiology, Growth stages, Mortality, Metabolism.

A series of experiments were conducted using fry, fingerling and age group II channel catfish and fingerling blue catfish. Evaluations were made on growth and survival of fish using feeds containing various percentages of proteins; sinking or floating feeds; different feeding rates; and various feeding methods. Intermediary metabolism; effects of various feeding regimens on certain blood components; and tissue structure of the digestive tract also were studied. Data on the various feeds used in the experiments are tabulated; and a summary

of treatments, stocking, survival and conversions is presented. Survival in treatments varied from 95.9% to 100% in all regimens. (Woodard-USGS) W74-03802

OHIO MUSSEL FISHERIES INVESTIGATION.
PART I: MUSSEL STUDIES. PART II: WATER CHEMISTRY AND SEDIMENT ANALYSES.
PART III: PLANKTON SURVEY,
Eastern Michigan Univ., Ypsilanti.
For primary bibliographic entry see Field 5C.
W74-03931

OHIO MUSSEL FISHERIES INVESTIGATION.
PART I: MUSSEL STUDIES,
Eastern Michigan Univ., Ypsilanti.
J. M. Bates.
Ohio Division of Wildlife, Columbus; and National Marine Fisheries Service, Washington, D.C., completion report November 1970, p 1-108, 111 fig, 26 tab. 4-28-R. 14-17-0004-433.

Descriptors: *Ohio, *Mussels, *Fishes, History, Systematics, Harvesting, Clams, Reproduction, Parasitism, Distribution, Oligochates, Trematodes, Regulation, Standing crops, Management, Rivers, Plankton, Shellfish.
Identifiers: Muskingum River(Ohio), Ellis Dam(Ohio), Marietta(Ohio), Corbicula fluminea, Sanctuaries, Shells, Pearls, Tullberg layers.

The Muskingum River, Ohio today supports what are probably the finest fresh water mussel stocks in the world. Other streams and rivers in Ohio do not at present support mussel populations of any potential commercial importance. The location and extent of mussel beds, species composition and density, rate of harvest, rate of recruitment, sex, age, and size composition of populations, and other basic biological information were determined. Investigations into the basic phenomena of shell formation, particularly the composition of the extrapallial fluid, were undertaken. The present high market demand for shells has developed largely during the past two decades due directly to demand created by the Japanese cultured pearl industry. Harvesting methods are described. Histological studies indicate normal patterns of gametogenesis in all species. It is completely possible that stocking programs could be instituted to reconstitute commercially valuable populations in certain streams, as the viable nature of the mussel populations of the Muskingum River has been established. The introduced Asiatic clam, Corbicula fluminea, has invaded the lower stretches of the Muskingum River. (See also W74-03931) (Jones-Wisconsin) W74-03932

OHIO MUSSEL FISHERIES INVESTIGATION.
PART II: WATER CHEMISTRY AND SEDIMENT ANALYSES,
Eastern Michigan Univ., Ypsilanti.
For primary bibliographic entry see Field 5C.
W74-03933

OHIO MUSSEL FISHERIES INVESTIGATION.
PART III: PLANKTON SURVEY,
Eastern Michigan Univ., Ypsilanti.
For primary bibliographic entry see Field 5C.
W74-03934

AGE STRUCTURE AND GROWTH OF FISH IN WATERS OF NORTHERN TADZHIKISTAN, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zooligii i Parazitologii.
V. A. Maksunov.
Vopr Ikhtiol. Vol 12, No 4, p 713-727. 1972.
Identifiers: *Age groups, Benthos, Fish, *Growth, Mysidae, Northern, Productivity, *USSR(Tadzhikistan).

SCIENTIFIC AND TECHNICAL INFORMATION—Field 10

Secondary Publication And Distribution—Group 10C

The age and sexual composition of the population, linear growth and weight increases were analyzed for 13 species of fish in the most important commercial fishing grounds of the Tadzhik SSR (USSR) from 1950-1965. Food supply, environmental conditions and commercial use of reserves were considered. The size of the Mysidae population in 1963-1965 caused an increase in benthos productivity and a sharp improvement in feeding conditions.—Copyright 1973, Biological Abstracts, Inc.

W74-04071

INTENSIVE OUTDOOR CULTURE OF MARINE PHYTOPLANKTON ENRICHED WITH TREATED SEWAGE EFFLUENT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.

W74-04103

USE OF PHYTOPHAGOUS FISH TO CONTROL AQUATIC PLANTS,
Instytut Rybactwa Srodowiskowego, Zabieniec (Poland). Dept. of Fish Culture.
For primary bibliographic entry see Field 3B.

W74-04106

FEEDING AND FOOD RELATIONSHIPS OF THE TROUT SALMO ISCHCHAN KESSLER AND WHITEFISH COREGONUS LAVARETUS LUDOGA POLIAKOW OF LAKE SEVAN, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.

W74-04203

SOME ASPECTS OF THE THEORY OF EXPLOITATION OF FISH RESOURCES, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
G. V. Nikol'skii.
Vopr Ikhtiol. Vol 12, No 4, p 603-671. 1972.
Identifiers: Fecundity, *Fish management, Resources, Fish population, *Fisheries(Exploitation), *Commercial fishing, Fish farming.

Biological and economical aspects of the exploitation of fish resources are discussed. The decrease in resources caused by commercial exploitation is contrasted to the accomplishments of fish farming which provide means for increasing the productivity of natural areas. Effects of fishing on such factors as fecundity, population structure, use of food, and recruitment are included. Principles for rational control of commercial fishing, including agreements involving international waters are explored.—Copyright 1973, Biological Abstracts, Inc.

W74-04278

WATER SUPPLY IN THE VOLGA BASIN AND ITS EFFECT ON STURGEON REPRODUCTION, FAMILY ACIPENSERIDAE UNDER CONDITIONS OF NATURAL AND REGULATED FLOW, (IN RUSSIAN),
Tsentralnyi Nauchno-Issledovatel'skii Institut Osetrovoogo Khozyaistva, Astrakhan (USSR).
P. N. Khoroshko.
Vopr Ikhtiol. Vol 12, No 4, p 665-673. 1972. Illus.
Identifiers: Acipenseridae, Bream, *Flow regulation, Ide, Reproduction, *Spawning grounds, *Sturgeon reproduction, *USSR(Volga River basin).

Regulation of the flow of the Volga (USSR) eliminated most of the spawning grounds and had unfavorable effects on the conditions of reproduction. Reproductive efficiency was directly related to the volume of flow, nature of the flood wave and water temperature. Sharp changes in the flow during the winter affected behavior during maturation of the reproductive bodies. In some cases changes in the bream, ide and silver bream popula-

tions led to consumption of sturgeon eggs by these fish. Despite the unstable hydrological regime of the Volga, sturgeon reproduction continued at a rather high rate. About 4 billion eggs were produced yearly in channel spawning grounds of the Lower Volga.—Copyright 1973, Biological Abstracts, Inc.

W74-04279

CLOSED SEASON REGULATION FOR TABLE FISH IN THE SUKHANDAR'YA RIVER BASIN, (IN RUSSIAN),

Akademiya Nauk Uzbekskoi SSR, Tashkent. Institut Zoologii i Parazitologii.

A. M. Mukhamediev, and K. S. Sattarov.

Uzb Biol Zh. Vol 16, No 4, p 41-42. 1972.

Identifiers: *Fish regulation(Seasonal), River basins, *USSR(Sukhandar'ya River basin).

The March 16 through May 31 period is recommended as closed season for table fish in the Sukhandar'ya river basin (USSR) on the basis of a study of life cycles of this fauna.—Copyright 1973, Biological Abstracts, Inc.

W74-04290

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

MONTEREY BAY BIBLIOGRAPHY.

Moss Landing Marine Labs., Calif.

For primary bibliographic entry see Field 02L.

W74-04218

MONTEREY BAY BIBLIOGRAPHY. SUPPLEMENT NUMBER ONE.

Moss Landing Marine Labs., Calif.

For primary bibliographic entry see Field 02L.

W74-04219



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Results of Acclimatization of Corophium sowinskyi (Mart.) in the Veselovsk Reservoir, (In Russian), W74-04099	2H	ERGS, W74-04264	2J	5B
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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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